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REPORT

of the

Army Field Forces

Board No. 3

FORT BENNING, GEORGIA

VOLUME 2 OF 2 VOLUMES

Project No. 2231

REPORT OF JOINT TEST OF UNITED STATES AND UNITED KINGDOM
LIGHTWEIGHT RIFLES AND AMMUNITION THEREFOR
INCLUDING IMPLEMENTING ACTION BY A.F.F. BOARD NO. 3

Date 27 October 1950

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ARMY FIELD FORCES BOARD NO. 3
Fort Benning, Georgia

APPENDIX C - DETAILS OF TEST

REPORT OF TEST - PROJECT NO. 2231

APPENDIX C

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Test No. 1:

1. Purpose: To determine the physical characteristics of the test rifles.

2. Method:

a. Rifles and accessories were weighed and measured locally. Where complete data could not be obtained with equipment available, results of the Light Rifle Test, Aberdeen Proving Ground, Maryland, were used. (App. F-1)

3. Results:

See Appendix "B".

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Test No. 2:

1. Purpose: To determine that part of the combat load attributable solely to the tested rifle, accessories and ammunition imposed on the individual soldier.

2. Method:

a. All test rifles, the U. S. M-1 rifle and the British No. 4 rifle were weighed.

b. The accessories for each rifle were weighed and their weights added item by item to those of the rifle.

c. 200 rounds of the appropriate type of ammunition were weighed and the weight added to the combined weight of rifle and accessories.

d. 10 empty magazines for each test rifle were weighed, and their weight added to the weight of rifle, accessories and ammunition.

e. The above cumulative weight totals were taken to form means for comparison of the basic items of a combat load.

3. Results:

The weights of the components of the loads described in paragraphs 2 a - e, above, are as follows:

(In Pounds)

Items	M-1	No. 4	T-25	EM-2	FN
Weight of Rifle and Sling	10.23	9.25	8.38	8.53	9.07
Bayonet and Scabbard	1.24	1.00	.90	1.12	1.00
Total	11.47	10.25	9.28	9.65	10.07
Bipod			.80	.70	.57
Grenade Launcher	.63		.33	.66	.65
Total	12.10		10.41	11.01	11.29
200 Rounds Ammunition	11.36		10.38	9.10	9.10
Total	23.46		20.79	20.11	20.39
Clips or 10 Empty Magazines:	2.18		6.20	5.40	4.88
Total	25.64		26.99	25.51	25.27

Figure No. 1

4. Analysis:

a. The three test rifles with attachments of bayonet, scabbard and sling are all lighter than the U. S. rifle M-1 and the British rifle No. 4; the T-25 (9.28 lbs) being the lightest and the FN (10.07 lbs) the heaviest.

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b. The British rifle No. 4 being a bolt action rifle is not suitable for further comparison with any of the test rifles.

c. Compared with the M-1 with accessories and 200 rounds of ammunition in clips, the EM-2 and FN with accessories and 200 rounds of ammunition in magazines are both slightly lighter, while the T-25 under the same conditions is slightly heavier. The weights of the rifles with accessories and 200 rounds of ammunition are: M-1 25.64 lbs, FN 25.27 lbs, EM-2 25.51 lbs, and the T-25 26.99 lbs.

d. While the T-25 with normal attachments is lighter than the EM-2 and FN (paragraph a above) the addition of 200 rounds in magazines makes it the heaviest of the three rifles (paragraph c above). This is due to the heavier caliber .30 ammunition and T-25 magazine. The weights of 200 rounds in magazines are: T104 (T25) 16.58 lbs, .280 (EM-2) 14.50 lbs, .280 (FN) 13.98 lbs, (200 rounds caliber .30 ammunition in clips (M-1) 13.54 lbs). (App. F-2, F-3, F-4, F-5, F-6)

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Test No. 3

1. Purpose: To determine the comparative ease of assembly and disassembly and difficulty of training therein, of the tested rifles.

2. Method:

a. The U. S. M-1 rifle was used as a control item.

b. One squad consisting of six U. S. and six Canadian enlisted men was given instruction in the assembly and disassembly of each of the four weapons. For each weapon observations were made as to difficulties in stripping and assembling and training therein. Test Personnel were then required to perform two types of assembly and disassembly with each weapon: field stripping and complete disassembly for maintenance purposes. Each individual made three trials of each type of assembly and disassembly with each type weapon. Time required was noted in each instance. Details for each weapon follow:

(1) FN

(a) Date of instructional periods: 3 May 1950.

(b) Date of testing period: 3 May 1950.

(c) Field Stripping Test: Disassembly to include complete disassembly of breech block, but not to include gas plug, piston and spring, and trigger group nor removal of body locking pin.

(d) Maintenance disassembly test: Disassembly to include complete disassembly of breech block, gas plug, piston and spring, but not to include trigger group nor removal of body locking pin.

(e) Tools used in all tests: One dummy round only.

(2) EM-2

(a) Date of instructional period: 5 and 8 May 1950.

(b) Dates of testing periods: 5 and 8 May 1950.

(c) Field Stripping test: Disassembly of breech block down to firing pin and extractor. This included removal of butt and piston group but did not include removal of ejector, trigger group, handguard or gas regulator.

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(d) Maintenance disassembly test: Included disassembly as in field stripping plus removal of trigger group, handguard and gas regulator. The trigger group was not disassembled nor was the ejector removed.

(e) Tools used in all tests: EM-2 Combination Tool.

(3) M-1

(a) Date of instructional period: 10 May 1950.

(b) Date of testing period: 10 and 11 May 1950.

(c) Field Stripping test: Disassembly to include complete stripping of bolt but not to include removal of gas plug, gas cylinder or operating rod.

(d) Maintenance disassembly: Disassembly as for field stripping plus removal of operating rod and gas plug.

(e) Tools used in all tests: M-1 Combination Tool.

(4) T-25

(a) Date of instructional period: 11 and 12 May 1950.

(b) Date of testing period: 12 May 1950.

(c) Field Stripping Test: Disassembly of bolt down to the firing pin and extractor, requiring removal of the ejector, stock, trigger group, automatic group, main spring, hammer lock, and the partial disengagement of the operating rod from the receiver.

(d) Maintenance Stripping Test: Disassembly of components as in field stripping, plus complete removal of operating rod and guide, gas plug and piston.

(e) Tools used in all tests: Combination Tool Bar, drift and/or punch.

(5) Particulars of test personnel:

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Rank	Name	Nationality	Age	Service
Cpl	Wideman	U. S.	28	8 years
Cpl	Wertenberger	U. S.	24	7 years
Cpl	Christian	U. S.	33	8 years
Pvt	Sturgis	U. S.	18	2½ years
Pvt	Gordon	U. S.	24	2 years
Pvt	McMenamin	U. S.	20	2½ years
Pvt	Coulas	Canada	26	7 years
Pvt	Wilson	Canada	20	2 years
Pvt	Cattral	Canada	21	1 year
Pvt	Paradis	Canada	24	4 months
Pvt	Degan	Canada	17	4 months
Pvt	Moffatt	Canada	24	4 months

3. Results:

a. The average time in seconds required by each of the twelve men to disassemble and assemble the four weapons is shown in Figure Nos. 1 through 4 below:

EASE OF ASSEMBLY AND DISASSEMBLY

Time in Seconds

FIELD STRIPPING

	1st Trial	2nd Trial	3rd Trial	Average of 3 Trials
EM-2	83	74	65	74
FN	64	42	34	47
M-1	65	64	47	59
T-25	103	121	96	107

Figure No. 1

ASSEMBLY AFTER FIELD STRIPPING

	1st Trial	2nd Trial	3rd Trial	Average of 3 Trials
EM-2	228	179	178	195
FN	75	62	63	67
M-1	129	137	124	130
T-25	304	260	221	262

Figure No. 2

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MAINTENANCE STRIPPING

	1st Trial	2nd Trial	3rd Trial	Average of 3 Trials
EM-2	136	111	101	116
FN	51	44	42	46
M-1	62	63	59	61
T-25	133	147	188	156

Figure No. 3

ASSEMBLY AFTER MAINTENANCE STRIPPING

	1st Trial	2nd Trial	3rd Trial	Average of 3 Trials
EM-2	235	122	180	179
FN	77	79	68	75
M-1	135	155	137	142
T-25	377	342	358	359

Figure No. 4

b. FN

(1) The test subjects had no difficulty in absorbing the instruction and no difficulties were apparent in assembly or disassembly. The soldiers appeared impressed by the simplicity of the weapon.

(2) The only difficulty encountered was in preventing individuals from opening the gun with the muzzle pointing upwards, resulting in the breech falling out onto the floor.

c. EM-2

(1) Assembly of the breech was easily taught and readily understood; but, however familiar the individual was with the method of assembly, it was still possible for him to fail one or more times with the final positioning of the firing pin and sleeve. This element of chance contrasted with the simplicity of the remainder of the operation.

(2) It was very difficult to assemble the breech block other than on a flat surface.

(3) It was possible to insert the cocking handle, back to front, though this does not preclude its use.

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(4) It was possible, by disregarding the indicating marks, to assemble the firing pin wrongly in its sleeve, a fact which may not be detected until the pistol group is being replaced in the body. This occurred three times during the tests.

(5) In fitting and removing the handguard, considerable time was taken in the replacement and removal of the retaining screws.

d. M-1

(1) The main difficulty experienced was in the assembly of the bolt after stripping of extractor and firing pin. This was included in the test in order to effect a comparison for the remaining test weapons.

(2) Disengaging of operating rod from the bolt proved to be a minor difficulty.

e. T-25

(1) This weapon was difficult from the instructional angle and was less readily understood by those under instruction.

(2) In several phases of its assembly and disassembly the weapon required a degree of force which is deterrent to those under instruction. During the instruction and testing periods for this weapon a total of 10 cuts and abrasions were sustained among 12 members of the squad. This contrasted badly with the other 3 weapons which produced between them negligible injuries.

(3) In disassembly from a loaded state the first difficulty to be noticed was in the removal of the magazine due to the position of the magazine catch. This imposed a frequent delay of several seconds.

(4) The extractor was removed only by the application of an unusual degree of force.

(5) Considerable difficulty was experienced by all personnel in the assembly of the bolt. The compression of the extractor plunger is effected by use of the ejector assembly. This method is most unsatisfactory due to the instability of the ejector assembly. This operation was in consequence a lengthy and difficult one.

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(6) In replacing the piston in the cylinder, cases occurred of the gas port not being aligned with the gas vent in the barrel, thereby breaking the cycle of operation.

(7) The alignment of the three groups concerned prior to the insertion of the body locking pin required the use of a drift or punch - an operation which could not be performed with either the combination tool or a cartridge. Men who attempted to insert the body locking pin without the use of a drift or punch were rarely successful.

(8) In replacing the magazine on the gun, in the majority of cases, a further excessive delay was experienced. By comparison with the other weapons, the magazine appeared to engage much less readily.

(9) The combination tool used in this test did not combine all tools required to strip and assemble the gun without difficulty.

4. Analysis:

a. In all phases of stripping, assembly and instruction the FN was the simplest of the three rifles under test.

b. The control weapon U. S. Rifle M-1 was simpler in all phases of stripping, assembly and instruction than the EM-2 and the T-25.

c. The EM-2 was much simpler than the T-25 in all phases of stripping, assembly and instruction.

d. The FN (1 minute 15 seconds) was the easiest to assemble after maintenance stripping, while the T-25 (5 minutes 59 seconds) was the most difficult.

e. By far the simplest was the FN. The remainder in order were M-1, EM-2 and T-25. The T-25 was by far the hardest of the rifles tested and is undesirably difficult.

Test No. 4

1. Purpose: To determine the ease of care and cleaning and the equipment required for field maintenance.

2. Method:

a. The U. S. M-1 rifle was used as a control item.

b. Observations of the cleaning of rifles were made concurrently with all tests.

c. A record was kept of difficulties encountered.

d. By observation and by conferences with the NCO's in charge of each rifle, a list was compiled of the tools and/or accessories required to clean each type rifle.

e. The time required to strip and assemble for field maintenance was reported on in Test No. 3.

f. The adequacy of the combination tools furnished with the test rifles was noted.

3. Results:

a. No major difficulties were encountered in cleaning test rifles. The following difficulties were peculiar to each rifle:

(1) EM-2 Rifle: Carbon and metallic fouling built up in the gas cylinder, requiring a special wire brush for removal.

(2) FN Rifle: Carbon and metallic fouling built up in gas regulator, requiring a reamer for its removal.

(3) T-25 Rifle: Piston filled with carbon and metallic fouling. The two sizes of the interior of the piston required either a two sized reamer or two reamers for cleaning.

b. The items of equipment found to be necessary for field maintenance of the test rifles are as listed below:

(1) EM-2 Rifle:

(a) Cleaning rod, or the equivalent, with attachable brush for bore cleaning.

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(b) Issue type oil and cleaning cloth.

(c) Combination tool, including wire brush for gas cylinder.

(2) FN Rifle:

(a) Cleaning rod (rigid) with brushes for bore and a brush for gas cylinder.

(b) Issue type oil and cleaning cloth.

(c) Combination tool and reamer for gas regulator.

(3) T-25 Rifle:

(a) Cleaning rod, or the equivalent, with brush for bore.

(b) Issue type oil and cleaning cloth.

(c) Combination tool with two stage reamer (or two reamers) and chamber brush.

(4) M-1 Rifle:

(a) Cleaning rod, or equivalent, and brush for bore.

(b) Issue type oil and cleaning cloth.

(c) Combination tool with chamber brush.

c. No cleaning kits were provided with test rifles.

d. There is no place in test rifles to carry a cleaning kit.

e. Issue type oil was satisfactory for lubricating all weapons.

f. The average times required to field strip, carry out field maintenance and then reassemble the rifles are as listed below:

EM-2 - 19 minutes 24 seconds

FN - 17 minutes 11 seconds

M-1 - 18 minutes 9 seconds

T-25 - 21 minutes 9 seconds

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4. Analysis:

a. The FN and the EM-2 are satisfactory from the point of view of the ease of field maintenance. The T-25 is not satisfactory because it is undesirably complicated. The order of acceptability is FN, EM-2 and T-25.

b. A special spare parts and cleaning kit is required for all test rifles.

Test No. 5:

1. Purpose: To determine the stability, durability and suitability of sights and whether or not sights have a battle sight adjustment.

2. Method:

a. Sights were examined to determine the ease of reading graduations and the ease of setting and adjustment. Observation was made for these characteristics during all firing tests.

b. Sights were inspected periodically during all tests for failure or malfunctions.

c. Ten men ran an obstacle course twice with each type rifle. Where folding sights were provided (T-25 only) one rifle was carried with the sights raised and one with the sights lowered. In addition the men crawled through grass and brush with the sights both raised and lowered. Sights were inspected after each cycle for serviceability. For detailed description of the obstacle course see Test No. 17½.

d. Sights were tested under various conditions of visibility. Men were required to aim and fire the rifles at dusk, in darkness, and at night by the light 60mm mortar flares and to report the ease with which sights could be seen.

e. The field of view obtained with each type of sight was measured.

3. Results:

a. Description of sights:

(1) EM-2: The sight is an optical sight with no magnification. It has incorporated within it an inverted pointer and range graduations in graticule form. The tip of the pointer is zeroed for 100 yards and the graticules are calibrated for 300, 500, 700 and 900 yards. The lines are broken in the center to allow a clear view of the target. The sight is zeroed for elevation and direction by inserting spacer washers at two points provided in the sight frame. The line of sight is approximately 3.3" above the line of the bore.

(2) FN: The sights consist of a post foresight and an aperture rear sight. The rear sight is graduated from 100 to 600 yards. It is adjusted by pressing a spring catch and sliding the sight up or down a ramp. On releasing the catch, small

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projections drop into slots in the sides of the ramp, locking the sight in the required position. The line of sight is approximately 1.7" above the line of the bore.

(3) T-25: The sights consist of a post foresight and a screw adjusted aperture rear sight, both of which will fold down. The rear sight is graduated from 100 yards to 800 yards and is operated by screwing the post supporting the aperture up or down in one-minute-of-angle clicks. It is also fitted with windage adjustment. The line of sight is approximately 2.3" above the line of the bore.

b. Ease of Reading Setting and Adjustment:

(1) (a) EM-2: This sight is designed so that no adjustment or setting has to be made by the firer and is therefore the easiest to sight on the target with proper aiming point. To change elevation the firer selects the required graticule and brings it onto the target. There is no battle sight adjustment.

(b) FN: This sight was readily adjustable. The graduations are conveniently placed and can be seen with little or no movement of the head. There is no battle sight adjustment.

(c) T-25: The adjustment of this sight presented no particular difficulty. However, due to the screw type adjustment it could not be adjusted or set as readily as those of the other weapons, particularly for large changes in elevation. Raising the sights from the folded position presented no difficulty and entailed little loss of time. Sight graduations could be readily seen with minimum head movement by the firer in good light but in dim light the graduations were difficult to read. There is no battle sight adjustment.

(2) Obstacle Course: Each rifle traversed the course 10 times. Inspection after the test showed no damage or change to any of the sights except with the T-25 with sights raised; the front and rear sights were partly knocked down once, and the rear sight was knocked down once.

(3) Crawling through grass and thick brush: Each rifle was carried through the brush ten times. Inspection after the test showed no damage to any of the sights.

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(a) EM-2: Vines caught between sight frame and barrel once.

(b) FN: Rear sight changed setting twice.

(c) T-25:

1. Sights raised: Front sight caught in brush seven times and rear sight caught in brush nine times.

2. Sights lowered: Front sight caught in brush 6 times.

(4) Malfunctions: The sights of all weapons were inspected periodically during all the tests and the following defects were reported:

(a) EM-2: On four occasions the front screw securing the sight to the sight frame broke. Periodically, this screw required tightening.

(b) FN:

1. The two screws for lateral adjustment of the rear sight continuously worked loose. This also occurred after the screws were punched into position.

2. The small projection on the rear sight spring catch became chipped. This caused burrs on the outer edges of the adjustment slots in the ramp and caused the sight to jump out of position during firing.

(c) T-25: Lateral play developed at the pivot of the rear sight.

d. Ease of sighting and aiming under various light conditions:

(1) Normal light: During all firing tests under normal range conditions firers had no difficulty with the T-25 or FN sights, except that the blade of the FN is too thick for ease of aiming at ranges beyond 300 yards. In the case of the EM-2 some firers expressed the opinion that with the pointer and graticules, when laying off for wind, it was not so easy to maintain the same accuracy in point of aim for successive shots as with iron sights.

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(2) Dusk - Poor light: Firing at field type targets in conditions of very bad light at dusk, it was found difficult to see targets through the normal aperture sights of the T-25 and FN. The EM-2 sight was considerably easier to use under these conditions, though, again, opinions were still expressed that the pointer and graticules were too thick, particularly the pointer.

(3) At night under flares: The following information was obtained from the results of firing and from questioning firers:

(a) All firers preferred the EM-2 sight for shooting under these conditions.

(b) No firer could see through the aperture of the T-25 or FN but sighted over the top of it.

(c) Front sight of the T-25 was more easily seen than that of the FN.

(d) Firers considered that the inverted pointer of EM-2 sight inclined them to shoot high.

FIRING RESULTS UNDER FLARES (6 Targets)

Rifle	Total Rounds Fired	Total Number of Hits	Total Number of Targets Hit
T-25	49	27	18
EM-2	58	30	23
FN	55	21	11
M-1	57	23	14

Figure No. 1

e. Field of View: Field of view obtained with each sight was measured with the following results:

Rifle	Field Through Sights	Field Obscurred By Sight
T-25	2°	2° 30'
FN	3°	6°
EM-2	7°	Negligible
EM-2 Within Shield	9°	30'

Figure No. 2

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4. Analysis:

a. Stability of Sights: The order of merit is EM-2, T-25 and FN. The FN is not acceptably stable but can be made acceptable with minor modification.

b. Durability of Sights: The order of merit is EM-2 and T-25, about equal, followed by the FN. The FN is not acceptably durable but can be made so with minor modification.

c. Suitability of Sights: The order of merit for poor light conditions is EM-2, T-25 and FN; and in good light is T-25, FN and EM-2. All are acceptable.

d. Battle Sights: None of the sights had a battle sight adjustment.

e. The overall order of merit is EM-2, FN and T-25. The FN is not acceptable in its present form but can be made acceptable with minor modifications. The T-25 sight is not acceptable because of its basic design.

Test No. 6:

1. Purpose: To determine the comparative accuracy of the test rifles when fired semi-automatically.

2. Method: This test was conducted in five phases.

PHASE I

1. Purpose: To determine the comparative accuracy of the test rifles when fired from a bench rest.

2. Method:

a. The U. S. rifle M-1 was used as a control weapon.

b. Ten expert riflemen were selected to fire this test.

c. Each rifleman fired 3 groups of 10 rounds at each range with two of each of the test rifles.

d. All rifles were fired from a bench rest.

e. The ten riflemen fired at ranges of 100, 200, 300 and 600 yards, and the three best of these riflemen fired at 800 and 1000 yards.

f. In order to determine the effect of previous firing on the accuracy of the rifles, eight of the riflemen refired the test at ranges of 100, 300 and 600 yards after 5000 rounds had been fired from each rifle.

g. The mean radius (MR), the maximum horizontal deviation (MH), maximum vertical deviation (MV), and maximum spread (MS) were computed for each shot group.

3. Results:

a. ACCURACY (BENCH REST) NEW RIFLES (See Graph, Figure No. 9)

Range	EM-2				FN				M-1				T-25			
	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS
100	.18	.42	.50	.62	.21	.44	.59	.69	.18	.37	.49	.57	.14	.25	.40	.44
200	.35	.78	.94	1.12	.35	.84	.94	1.13	.38	.78	1.12	1.25	.26	.51	.72	.82
300	.51	1.19	1.48	1.76	.52	1.32	1.43	1.82	.56	1.28	1.57	1.88	.37	.79	1.03	1.23
600	1.01	2.39	2.71	3.28	1.04	2.35	2.96	3.49	1.04	2.31	2.88	3.35	.77	1.81	2.13	2.54
800	1.40	3.01	4.40	4.83	1.62	3.48	4.05	4.75	1.39	2.92	4.13	5.45	1.07	2.84	2.66	3.34
1000	2.11	5.28	5.23	6.82					2.13	5.22	4.67	6.52	1.56	3.77	4.00	5.01

Figure No. 1

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b. Detailed results of this firing are in Inclosure No. 1.

c. It was necessary to abandon efforts to fire the FN at 1000 yards because the sight provided with the rifle was graduated only to 600 yards. A local modification of the sight was successful for firing at 800 yards but not at 1000 yards.

d. AVERAGE ACCURACY (BENCH REST) AFTER 5000 ROUNDS (See Figure No. 10)

(Data in Feet)

Range	EM-2				FN				M-1				T-25			
	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS
100	.20	.43	.60	.68	.21	.43	.66	.71	.18	.37	.51	.59	.14	.27	.42	.50
300	.55	1.26	1.59	1.84	.57	1.22	1.55	1.60	.55	1.27	1.52	1.77	.39	.90	1.04	1.21
600	.99	2.22	2.61	3.12	1.10	2.28	3.15	3.82	.99	2.35	2.75	3.22	.79	1.75	1.95	2.47

Figure No. 2

e. Detailed results of this firing are Inclosure No. 2.

4. Analysis: (See Figures 9 and 10)

a. There was very little difference between the accuracy of the EM-2 and FN and both were about the same as the M-1 at ranges up to 600 yards.

b. The accuracy of the T-25 was superior to the accuracy of the EM-2, the FN, and the M-1.

c. The accuracy of the test rifles and the M-1 showed very little difference from when the barrels were new and after they had fired 5000 rounds.

d. The accuracy of test rifles was acceptable up to 600 yards, in comparison with the M-1.

e. The accuracy of the T-25 and EM-2 when compared with the M-1 was acceptable at ranges of 800 and 1000 yards.

f. It was not possible to determine the accuracy of the FN rifle at 1000 yards as it could not be sighted for this range.

PHASE II

1. Purpose: To determine the comparative accuracy of the test rifles when fired by riflemen of varying degrees of proficiency.

2. Method:

a. The U. S. rifle M-1 was used as a control weapon.

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b. Sixteen riflemen were selected; six experts, seven average firers and three recruits.

c. Three groups of ten rounds each at each range were fired by each rifleman with two rifles of each type.

d. All firing was from the prone position with the loop sling.

e. The ranges fired were 100, 200, 300 and 500 yards.

3. Results:

a. ACCURACY OF EXPERTS, AVERAGE SHOTS, AND RECRUITS (See Figures 11, 12, & 13)

MR in Feet - Range in Yards

PROFICIENCY	EM-2				FN				M-1				T-25			
	100	200	300	500	100	200	300	500	100	200	300	500	100	200	300	500
Experts	.21	.37	.58	1.16	.21	.40	.58	.99	.22	.41	.60	.95	.16	.32	.39	.59
Average	.29	.53	.72	1.10	.27	.50	.68	1.05	.28	.55	.70	1.10	.22	.40	.55	.73
Recruits	.47	.55	.86	1.22	.29	.53	.81	1.40	.30	.63	.78	1.20	.30	.62	.72	1.08

Figure No. 3

b. ACCURACY OF ALL FIRERS (See Graph, Figures 14)

(Data in Feet)

Range (Yards)	EM-2				FN				FN M-1				T-25			
	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS
100	.29	.70	.78	1.01	.25	.61	.70	.85	.26	.60	.71	.83	.21	.46	.57	.66
200	.47	1.12	1.29	1.52	.47	1.17	1.24	1.53	.51	1.14	1.47	1.73	.41	1.00	1.11	1.30
300	.69	1.63	1.96	2.23	.67	1.59	1.85	2.17	.68	1.57	1.92	2.20	.52	1.27	1.45	1.80
500	1.14	2.68	3.08	3.75	1.09	2.58	3.10	3.64	1.07	2.45	2.28	3.35	.75	1.85	1.98	2.47

Figure No. 4

c. Detailed results are in Inclosure No. 3.

4. Analysis:

a. The T-25 was more accurate than the EM-2, the FN, and the M-1.

b. The accuracy of the EM-2, the FN and the M-1 was almost the same at all ranges.

c. The difference between the experts and the average shots was not marked.

d. The difference between the experts and the recruits was greater with the T-25 than with the EM-2, the FN, and the M-1. (See Graph, Figure No. 15).

e. The accuracy of the test rifles is acceptable.

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PHASE III

1. Purpose: To determine the accuracy of the test rifles in sustained fire.

2. Method:

a. The U. S. rifle M-1 was used as a control weapon.

b. The riflemen who fired Phase II above fired this test. It was not possible to maintain the classification of the 16 men into experts, average shots, and recruits because the two latter categories had become more proficient.

c. Three groups of eight rounds each at each range were fired by each rifleman with two rifles of each type.

d. All firing was from the prone position with the loop sling.

e. Ranges fired were 100, 200 and 300 yards.

f. A time limit of twenty-five seconds was allowed for each group of eight rounds.

3. Results:

a. All firers were able to fire all eight rounds within the allotted time limit without difficulty.

b. The average results are shown below:

ACCURACY IN SUSTAINED FIRE (See Graph, Figure 16)
(Data in Feet)

Range	EM-2				FN				M-1				T-25			
(Yds)	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS	MR	MH	MV	MS
100	.32	.69	.81	1.00	.29	.63	.72	.93	.30	.67	.71	.91	.22	.48	.54	.66
200	.57	1.21	1.47	1.79	.54	1.29	1.32	1.67	.55	1.25	1.31	1.67	.44	.96	1.06	1.33
300	.87	1.71	2.04	2.47	.81	1.73	1.82	2.34	.79	1.76	1.88	2.45	.59	1.38	1.35	1.79

Figure No. 5

c. Detailed results are in Inclosure No. 4.

4. Analysis:

a. The T-25 was more accurate than the EM-2, the FN and the M-1 (See Graph, Figure No. 16).

b. The accuracy of the EM-2, the FN, and the M-1 were almost the same.

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c. The difference in accuracy between the timed (Phase III) and untimed firing (Phase II) was most marked with the EM-2, and least marked with T-25 (See Graph, Figure 17).

d. This test is concerned as much with the ease of aiming and firing as with accuracy.

PHASE IV

1. Purpose: To determine the change in accuracy and center of impact caused by heating the test rifles.

2. Method:

a. The U. S. rifle M-1 was used as a control weapon.

b. Six of the ten riflemen who fired Phase I above fired this test.

c. Each rifleman fired one of each type rifle.

d. All rifles were fired from a bench rest.

e. Range - 300 yards.

f. To establish a center of impact a group of ten rounds was fired from each rifle with the barrel cool. The rifles were then heated by firing eighty rounds semi-automatically as rapidly as possible. Three groups of ten rounds each were then fired with each rifle. The changes in the center of impact and in the mean radius were recorded.

3. Results:

a. CHANGE IN MR AND CI - COOL AND HOT BARREL
(Range - 300 Yards. Data in Feet)

Rifle	MR		Change in Center of Impact			
	Cool	Hot	Up	Down	Right	Left
EM-2	.59	.61		1.30	.12	
FN	.53	.62		1.18	.17	
M-1	.55	.63		.35	.24	
T-25	.35	.40		1.01	.10	

Figure No. 6

b. Detailed data is in Inclosure No. 5.

4 Analysis:

a. The changes in the mean radii were insignificant with all rifles.

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b. The change in the center of impact was least with the M-1. The center of impact with the three test rifles changed about the same. All were down about a foot and to the right about 2 inches.

c. The changes were acceptable.

PHASE V

1. Purpose: To determine the effect of the muzzle attachments on the accuracy and on the center of impact of the test rifles.

2. Method:

a. The U. S. rifle M-1 was used as a control weapon.

b. Nine of the ten riflemen who fired Phase I, above, fired this test.

c. Each rifleman fired one of each type rifle.

d. All rifles were fired from a bench rest.

e. The range was 300 yards.

f. Three groups of ten rounds were fired to establish the center of impact. The rifles were then fired in 3 groups of ten rounds with each of the muzzle attachments.

g. The muzzle attachments used were as follows:

FN	EM-2	M-1	T-25
Bayonet	Bayonet	Bayonet	Bayonet
Grenade Launcher	Grenade Launcher	Grenade Launcher	Grenade Launcher.
Bayonet & Flash Hider (combination)		Flash Hider	
Flash hider			
Recoil check.			

Figure No. 7

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3. Results:

a. CHANGES IN CENTER OF IMPACT AND IN ACCURACY DUE TO ATTACHMENTS

(Data in Feet)

U - Up D - Down R - Right L - Left

	EM-2			FN			M-1			T-25		
		CI Change			CI Change			CI Change			CI Change	
ATTACHMENT	MR	U/D	R/L	MR	U/D	R/L	MR	U/D	R/L	MR	U/D	R/L
None	.59	- -	- -	.61	- -	- -	.60	- -	- -	.37	- -	- -
Bayonet	.61	1.22U	.22R	.55	.60D	.55R	.87	1.00U	.35L	.38	3.77U	.36L
Comb Bay &FH	-	- -	- -	.61	1.67D	.10L	--	- -	- -	-	- -	- -
Grenade L.	.49	.41U	.67L	.82	.68U	.38L	.61	1.17U	.20L	.42	2.04U	1.36L
Flash Hider	-	- -	- -	.55	2.32D	.02L	.62	.26U	.38L	-	- -	- -
Recoil Check	-	- -	- -	.44	1.71D	.28L	-	- -	- -	-	- -	- -

Figure No. 8

b. Detailed data is shown in Inclosure No. 6.

4. Analysis:

a. Attachments to all rifles caused changes in the centers of impact.

b. The only attachments in common to all rifles were the bayonet and the grenade launcher.

c. The change caused by attaching the bayonet and the grenade launcher to the T-25 was much greater than the change caused by similar attachments to the other rifles.

d. The change in the center of impact due to attachments is acceptable with the M-1, the EM-2 and the FN. It is not acceptable with the T-25.

3. Analysis of Test No. 6 as a whole:

In semi-automatic fire the T-25 is the most accurate and the FN, EM-2 and the M-1 are about the same; all are acceptable except the T-25 when fired with bayonet and grenade launcher. The FN could not be tested at 1000 yards. (App. F-7, F-8, F-9)

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TEST 6, PHASE I.
ACCURACY OF ALL FIRERS.
NEW RIFLES.

SEMI-AUTOMATIC FIRE
NO TIME LIMIT

BENCH REST

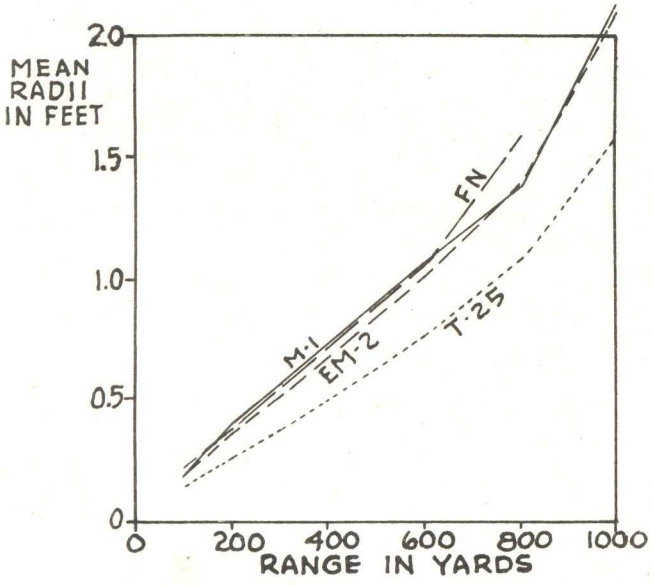

FIG. 9

TEST 6, PHASE I
ACCURACY OF ALL FIRERS.
AFTER 5000 ROUNDS.

SEMI-AUTOMATIC FIRE
NO TIME LIMIT

BENCH REST

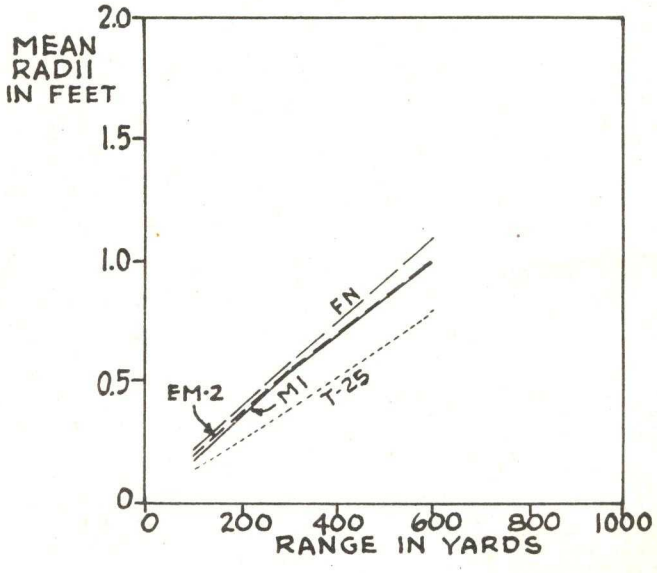

FIG. 10

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TEST 6, PHASE II
ACCURACY FIRING
SEMI - AUTOMATIC FIRE. NO TIME LIMIT
PRONE POSITION

LEGEND
EM-2 - - - - - - - -
FN ——— ——— ———
M-1 ———————
T-25 ----------

RECRUITS

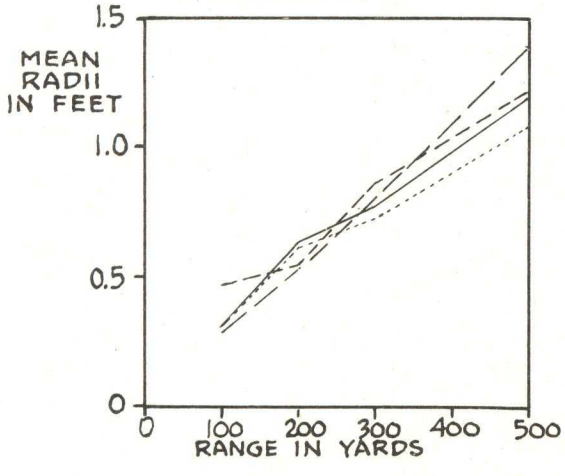

FIG. 11

AVERAGE FIRERS

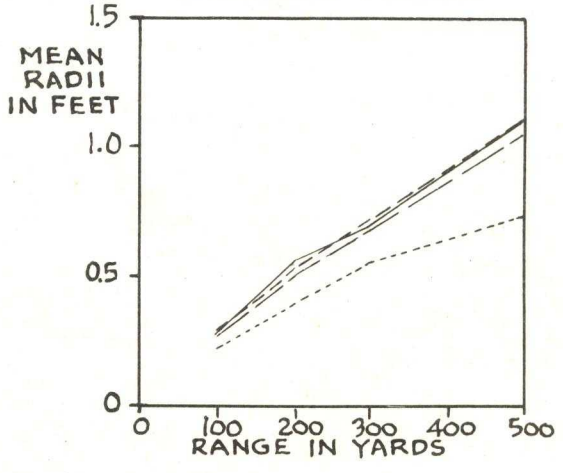

FIG. 13

EXPERTS

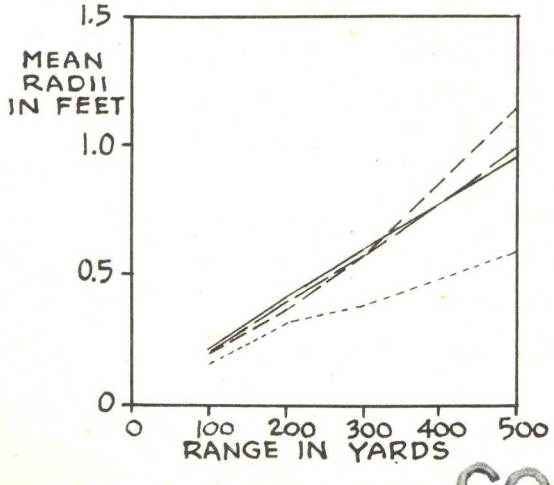

FIG. 12

ALL FIRERS

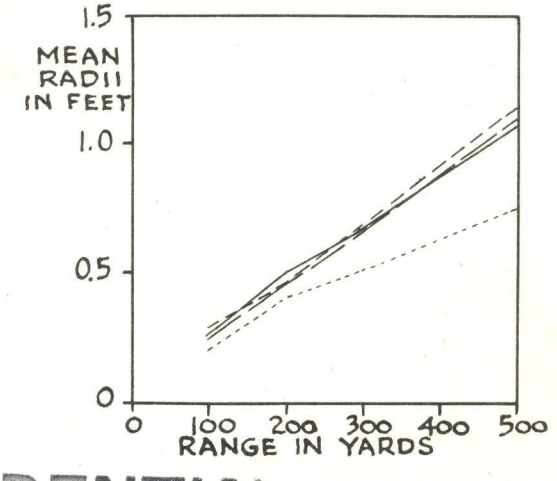

FIG. 14

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TEST 6, PHASE II.
DIFFERENCE IN ACCURACY BETWEEN EXPERTS & RECRUITS.
SEMI-AUTOMATIC FIRING.

NO TIME LIMIT.
PRONE POSITION.

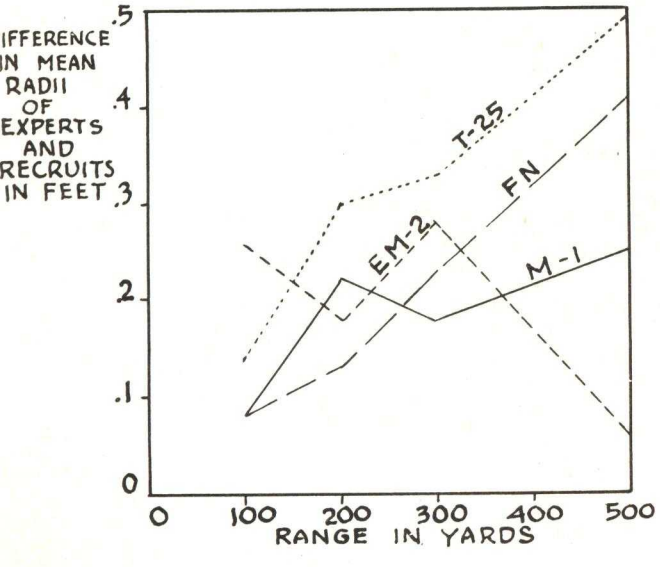

FIG. 15

TEST 6, PHASE II & III.
INCREASE IN MEAN RADII, ALL FIRERS, FROM SEMI-AUTOMATIC FIRE WITHOUT TIME LIMIT, TO SEMI-AUTOMATIC FIRE, 8 ROUNDS PER 25 SECONDS.
PRONE POSITION.

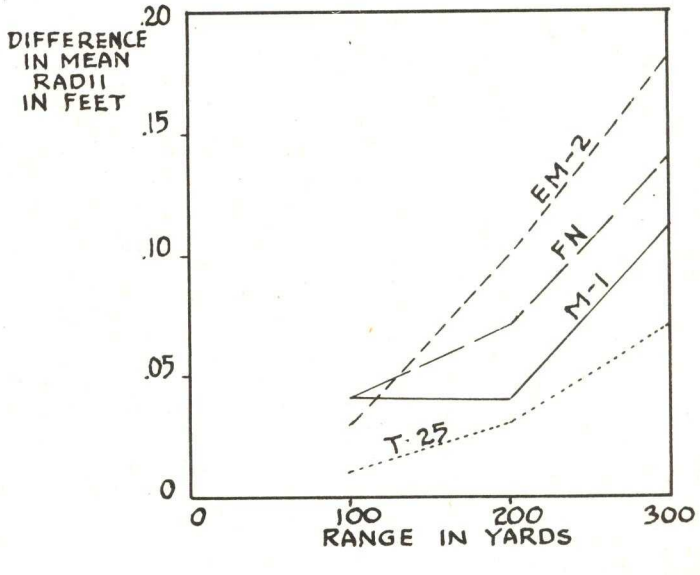

FIG. 17

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TEST 6 PHASE III

ACCURACY ALL FIRERS

SEMI-AUTOMATIC
SUSTAINED FIRE
(8 ROUNDS PER 25 SECONDS)

PRONE POSITION

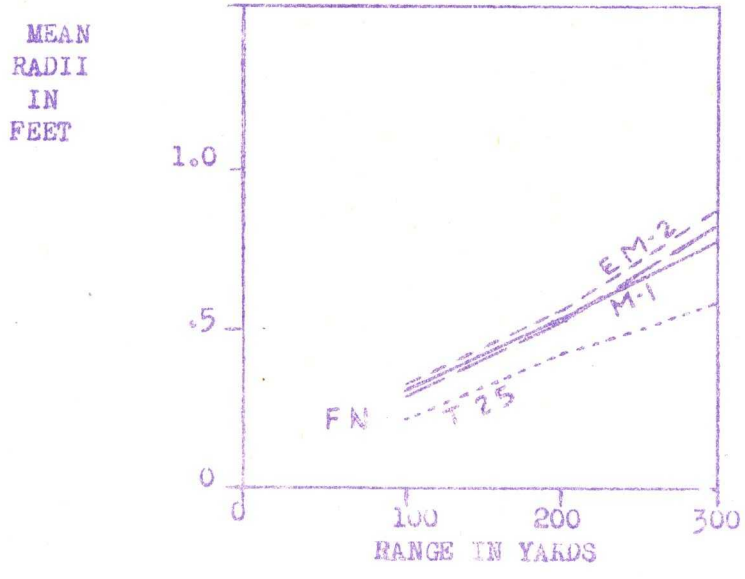

FIG. 16

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Bench Rest. No time limit. 100 yards

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Prestridge	.17	.24	.18	.16
2. Herrin	.19	.24	.13	.12
3. Thwaites	.17	.20	.14	.11
4. Foxworth	.16	.25	.25	.15
5. Roberts	.17	.25	.19	.12
6. Grigg	.19	.16	.22	.18
7. Herbert	.15	.18	.14	.17
8. Martin	.22	.16	.15	.12
9. Senechal	.24	.20	.22	.14
10. White	.16	.22	.18	.11
Average	.18	.21	.18	.14

Same shot groups as above. Maximum horizontal and vertical dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM2	FN	M-1	T-25
1. Prestridge	.30	.47	.41	.25	.54	.67	.50	.50	.60	.77	.54	.53
2. Herrin	.42	.42	.33	.26	.50	.73	.30	.36	.62	.75	.40	.40
3. Thwaites	.35	.40	.31	.23	.50	.53	.39	.29	.56	.72	.48	.33
4. Foxworth	.39	.53	.37	.35	.45	.59	.56	.44	.54	.74	.61	.55
5. Roberts	.39	.53	.35	.24	.50	.59	.63	.36	.56	.77	.67	.38
6. Grigg	.45	.34	.37	.31	.57	.45	.67	.44	.64	.51	.72	.46
7. Herbert	.31	.37	.26	.24	.35	.52	.41	.57	.45	.63	.50	.62
8. Martin	.55	.37	.45	.17	.42	.52	.39	.31	.69	.62	.56	.33
9. Senechal	.62	.46	.48	.21	.66	.52	.56	.42	.94	.61	.66	.46
10. White	.46	.46	.32	.21	.46	.74	.51	.33	.60	.78	.60	.36
Average	.42	.44	.37	.25	.50	.59	.49	.40	.62	.69	.57	.44

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Bench Rest. No time limit. 200 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Prestridge	.35	.37	.36	.31
2. Herrin	.40	.36	.36	.29
3. Thwaites	.31	.30	.41	.20
4. Foxworth	.32	.31	.40	.30
5. Roberts	.38	.34	.32	.23
6. Grigg	.39	.36	.38	.28
7. Herbert	.32	.39	.34	.24
8. Martin	.32	.31	.37	.25
9. Senechal	.35	.38	.39	.25
10. White	.31	.37	.44	.24
Average	.35	.35	.38	.26

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet)

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Prestridge	.81	.92	.81	.42	.96	1.05	.93	.75	1.11	1.23	1.24	.81
2. Herrin	.89	1.21	.76	.65	1.01	.75	.94	.77	1.21	1.29	1.06	.97
3. Thwaites	.73	.70	.69	.38	.65	.92	1.23	.47	.87	1.15	1.33	.61
4. Foxworth	.77	.79	.85	.55	.91	.83	1.14	.83	1.10	1.04	1.42	.89
5. Roberts	.93	.74	.81	.45	1.15	.95	.95	.72	1.40	1.07	1.31	.74
6. Grigg	.81	.90	.83	.52	1.12	1.07	1.04	.91	1.22	1.19	1.19	.99
7. Herbert	.74	.68	.76	.51	.82	.91	1.16	.65	.97	1.03	1.25	.74
8. Martin	.63	.80	.75	.58	.90	.77	1.34	.71	1.04	.90	1.31	.82
9. Senechal	.77	.75	.72	.57	1.08	1.21	1.12	.71	1.30	1.31	1.18	.85
10. White	.75	.92	.77	.44	.80	.93	1.31	.68	.97	1.10	1.19	.73
Average	.78	.84	.78	.51	.94	.94	1.12	.72	1.12	1.13	1.25	.82

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Bench rest. No time limit. 300 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle

	EM-2	FN	M-1	T-25
1. Prestridge	.53	.50	.54	.42
2. Herrin	.60	.62	.65	.38
3. Thwaites	.47	.48	.54	.28
4. Foxworth	.39	.52	.59	.38
5. Roberts	.53	.47	.59	.36
6. Grigg	.65	.61	.60	.55
7. Herbert	.43	.48	.48	.29
8. Martin	.53	.45	.52	.27
9. Senechal	.53	.55	.52	.44
10. White	.48	.51	.52	.33
Average	.51	.52	.56	.37

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Prestridge	1.05	1.23	1.32	.94	1.75	1.41	1.51	1.43	1.91	1.73	1.79	1.53
2. Herrin	1.25	1.50	1.64	.76	1.48	1.97	1.25	1.09	1.75	2.31	1.88	1.23
3. Thwaites	1.00	.97	1.14	.45	1.43	1.44	1.83	.98	1.56	1.58	2.11	1.05
4. Foxworth	1.09	1.50	1.17	.72	1.13	1.24	1.68	1.05	1.62	1.77	1.85	1.13
5. Roberts	.87	1.20	1.60	1.05	1.58	1.37	1.42	.78	1.63	1.73	2.03	1.21
6. Grigg	1.64	1.77	1.15	1.07	1.78	1.58	1.96	1.52	2.08	2.24	2.17	1.84
7. Herbert	1.36	1.31	.95	.55	1.25	1.16	1.48	.88	1.71	1.61	1.56	.97
8. Martin	1.14	1.25	1.27	.61	1.79	1.02	1.49	.72	.96	1.47	1.85	.83
9. Senechal	1.62	1.34	1.44	1.01	1.23	1.55	1.37	1.01	1.74	1.82	1.81	1.40
10. White	.84	1.09	1.07	.73	1.41	1.57	1.65	.84	1.61	1.88	1.75	1.07
Average	1.19	1.32	1.28	.79	1.48	1.43	1.57	1.03	1.76	1.82	1.88	1.23

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Bench Rest. No time limit. 600 yards

Mean Radius in feet. Average of 6 shot groups per type rifle

	EM-2	FN	M-1	T-25
1. Prestridge	.97	1.33	1.04	.91
2. Herrin	1.11	1.06	.94	.91
3. Thwaites	.87	1.02	.81	.60
4. Foxworth	1.16	.98	1.11	.98
5. Roberts	1.08	1.02	1.24	.77
6. Grigg	1.05	.96	1.13	.74
7. Herbert	.90	.94	.93	.68
8. Martin	.90	1.10	1.05	.68
9. Senechal	.98	1.02	1.21	.77
10. White	1.08	.94	.89	.62
Average	1.01	1.04	1.04	.77

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Prestridge	1.93	2.41	3.27	2.11	2.83	2.80	3.01	2.67	3.10	3.49	3.63	3.14
2. Herrin	2.39	2.54	2.39	2.23	2.72	3.08	2.51	2.47	3.29	3.76	3.07	2.91
3. Thwaites	2.03	2.50	1.73	1.55	2.35	2.66	2.34	1.45	2.90	3.37	2.72	1.89
4. Foxworth	3.24	2.22	1.95	1.91	2.76	2.87	3.21	3.09	3.81	3.39	3.38	3.26
5. Roberts	2.78	2.27	2.08	1.97	2.95	3.10	3.26	1.95	3.62	3.39	3.57	2.44
6. Grigg	2.32	2.57	2.16	1.90	2.79	2.78	3.75	2.02	3.00	3.47	3.89	2.39
7. Herbert	1.96	2.12	2.11	1.48	2.66	3.05	2.14	2.10	3.15	3.31	2.75	2.41
8. Martin	1.87	2.83	2.51	1.74	2.76	3.39	3.20	1.96	2.94	4.02	3.78	2.32
9. Senechal	2.45	1.62	2.97	1.71	2.40	3.06	3.04	2.05	3.22	3.17	3.69	2.69
10. White	2.92	2.40	1.97	1.45	2.83	2.84	2.35	1.58	3.81	3.50	3.03	1.96
Average	2.39	2.35	2.31	1.81	2.71	2.96	2.88	2.13	3.28	3.49	3.35	2.54

Inclosure No. 1, T-6

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Bench Rest. No time limit. 800 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Herrin	1.21	1.61	1.50	1.07
2. Roberts	1.42	1.62	1.28	.94
3. Martin	1.57	1.64	1.40	1.19
Average	1.40	1.62	1.39	1.07

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Herrin	2.55	4.47	3.23	2.88	3.51	3.36	4.72	2.72	3.83	5.05	4.89	3.45
2. Roberts	3.19	2.87	2.82	2.73	5.11	4.70	3.81	2.54	5.72	5.07	4.38	3.18
3. Martin	3.28	3.09	2.72	2.92	4.58	4.10	3.86	2.71	4.95	4.14	7.08	3.40
Average	3.01	3.48	2.92	2.84	4.40	4.05	4.13	2.66	4.83	4.75	5.45	3.34

Inclosure No. 1, T-6

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Authority NND 735022

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Bench Rest. No time limit. 1000 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Herrin	2.32	Not	2.06	1.69
2. Roberts	1.84	fired	1.98	1.57
3. Martin	2.18		2.35	1.41
Average	2.11		2.13	1.56

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Herrin	5.33		4.17	4.45	5.66		5.83	4.63	7.70		6.58	5.63
2. Roberts	4.46		5.90	3.46	5.04		3.40	4.35	5.82		6.37	4.98
3. Martin	6.06		5.58	3.40	4.98		4.78	3.03	6.93		6.62	4.43
Average	5.28		5.22	3.77	5.23		4.67	4.00	6.82		6.52	5.01

Inclosure No. 1, T-6

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Bench Rest. No time limit. 100 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Herrin	.19	.23	.18	.14
2. Roberts	.17	.18	.16	.12
3. White	.21	.17	.16	.11
4. Martin	.18	.24	.20	.18
5. Thwaites	.18	.24	.17	.11
6. Grigg	.20	.18	.17	.15
7. Prestridge	.20	.20	.19	.14
8. Foxworth	.29	.22	.19	.16
Average	.20	.21	.18	.14

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Herrin	.46	.45	.45	.28	.56	.67	.57	.35	.69	.78	.63	.42
2. Roberts	.46	.37	.33	.27	.46	.51	.46	.33	.58	.57	.51	.41
3. White	.45	.41	.33	.27	.65	.48	.43	.40	.69	.61	.54	.46
4. Martin	.40	.38	.24	.21	.56	1.01	.48	.72	.62	.62	.49	.77
5. Thwaites	.36	.57	.48	.25	.54	.87	.46	.28	.56	.97	.62	.35
6. Grigg	.41	.34	.34	.29	.58	.54	.47	.41	.64	.60	.54	.51
7. Prestridge	.38	.47	.37	.25	.43	.60	.72	.43	.53	.77	.82	.49
8. Foxworth	.51	.46	.40	.34	1.02	.58	.49	.47	1.13	.72	.60	.60
Average	.43	.43	.37	.27	.60	.66	.51	.42	.68	.71	.59	.50

Inclosure No. 2, T-6

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Bench Rest. No time limit. 300 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Herrin	.62	.56	.50	.47
2. Roberts	.51	.59	.59	.34
3. White	.53	.51	.56	.29
4. Martin	.58	.57	.55	.35
5. Thwaites	.50	.57	.45	.40
6. Grigg	.51	.62	.55	.34
7. Prestridge	.58	.56	.67	.44
8. Foxworth	.58	.56	.54	.48
Average	.55	.57	.55	.39

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Herrin	1.51	1.36	1.32	.97	1.95	1.57	1.39	1.37	2.18	1.78	1.78	1.50
2. Roberts	1.32	1.27	1.22	.75	1.43	1.51	1.78	.99	1.69	1.72	1.97	1.14
3. White	1.17	1.21	1.20	.77	1.46	1.47	1.58	.74	1.63	1.84	1.72	1.00
4. Martin	1.18	1.11	1.33	.82	1.83	1.64	1.29	.96	1.97	1.85	1.84	1.11
5. Thwaites	1.01	1.24	1.15	.68	1.36	1.44	1.07	.86	1.71	1.77	1.38	1.00
6. Grigg	1.33	1.14	1.18	.83	1.59	1.82	1.47	.96	1.86	1.31	1.69	1.16
7. Prestridge	1.13	1.22	1.23	1.16	1.37	1.61	2.26	1.13	1.67	1.85	2.35	1.36
8. Foxworth	1.46	1.19	1.54	1.18	1.75	1.31	1.34	1.33	2.01	1.68	1.43	1.38
Average	1.26	1.22	1.27	.90	1.59	1.55	1.52	1.04	1.84	1.60	1.77	1.21

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Authority NND 735022

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Bench Rest. No time limit. 600 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Herrin	1.19	1.38	.97	.82
2. Roberts	1.02	.95	.90	.80
3. White	.80	.98	1.04	.69
4. Martin	.93	1.26	.87	.75
5. Thwaites	1.09	.99	.95	.70
6. Grigg	.84	.96	.84	.73
7. Prestridge	1.01	1.03	1.09	.73
8. Foxworth	1.01	1.22	1.22	.83
Average	.99	1.10	.99	.79

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Herrin	2.86	2.82	2.69	1.85	2.97	4.14	2.59	2.05	3.72	5.14	3.32	2.56
2. Roberts	2.26	1.96	2.10	1.47	2.69	2.51	2.94	2.26	3.16	3.69	3.49	2.47
3. White	1.60	1.78	2.52	1.56	2.10	2.65	2.51	1.82	2.45	3.23	3.06	2.17
4. Martin	2.53	2.52	2.09	1.87	2.46	3.34	2.24	1.77	3.26	4.05	2.74	2.26
5. Thwaites	2.15	2.31	2.55	1.93	2.71	3.03	2.46	1.59	2.95	3.38	2.91	2.35
6. Grigg	2.15	1.99	2.11	2.02	2.30	3.18	2.34	1.76	2.88	3.43	2.69	2.43
7. Prestridge	1.78	2.18	2.37	1.65	2.65	2.90	3.45	1.82	2.99	3.81	3.60	2.81
8. Foxworth	2.41	2.68	2.33	1.63	3.01	3.41	3.50	2.50	3.54	3.85	3.91	2.71
Average	2.22	2.28	2.35	1.75	2.61	3.15	2.75	1.95	3.12	3.82	3.22	2.47

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Prone. No time limit. 100 yards

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Senechal	.22	.22	.26	.15
2. Grigg	.20	.19	.20	.14
3. White	.18	.18	.19	.17
4. Roberts	.20	.21	.23	.18
5. Foxworth	.21	.21	.22	.16
6. Herrin	.22	.22	.21	.14
Average (Experts)	.21	.21	.22	.16
7. Gordon	.35	.24	.25	.22
8. Wideman	.24	.20	.23	.22
9. Wertenberger	.25	.21	.26	.19
10. McMenamin	.21	.27	.19	.15
11. McCoy	.42	.40	.40	.32
12. Coulas	.35	.41	.43	.30
13. Paille	.24	.16	.20	.14
Average (Average Firers)	.29	.27	.28	.22
14. Paradise	.31	.24	.27	.23
15. Moffatt	.64	.35	.30	.35
16. Degan	.47	.29	.33	.32
Average (Recruits)	.47	.29	.30	.30
Average (All Firers)	.29	.25	.26	.21

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	.75	.60	.55	.32	.54	.55	1.16	.43	.87	.76	.79	.47
2. Grigg	.45	.41	.34	.29	.53	.52	.59	.36	.71	.58	.57	.44
3. White	.34	.36	.40	.30	.45	.57	.46	.36	.50	.61	.66	.40
4. Roberts	.42	.36	.36	.30	.42	.57	.60	.51	.56	.61	.63	.56
5. Foxworth	.41	.42	.46	.36	.55	.63	.66	.49	.65	.73	.73	.55
6. Herrin	.59	.72	.44	.28	.53	.59	.55	.39	.68	.82	.65	.44
7. Gordon	.84	.56	.64	.59	.76	.74	.56	.49	1.23	.82	.80	.69
8. Wideman	.50	.45	.50	.52	.63	.57	.68	.63	.75	.67	.75	.74
9. Wertenberger	.61	.47	.54	.48	.74	.62	.66	.62	.96	.67	.78	.74
10. McMenamin	.53	.57	.49	.27	.48	.92	.55	.41	.63	.98	.63	.47
11. McCoy	.80	1.18	.99	.83	1.36	.75	.92	.89	1.44	1.26	1.19	1.13
12. Coulas	.91	.97	1.39	.62	.94	1.21	.99	.79	1.23	1.52	1.60	.94
13. Paille	.61	.39	.45	.31	.56	.47	.59	.39	.79	.52	.68	.41
14. Paradise	.64	.51	.55	.46	.96	.83	.82	.62	1.12	.93	.88	.67
15. Moffatt	1.51	.78	.64	.73	1.86	.88	.80	.93	2.18	1.03	.96	1.11
16. Degan	1.34	.93	.83	.73	1.22	.72	.82	.87	1.79	1.06	.99	1.12
Average	.70	.61	.60	.46	.78	.70	.71	.57	1.01	.85	.83	.66

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Prone. No time limit. 200 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Senechal	.46	.49	.46	.45
2. Grigg	.28	.34	.35	.25
3. White	.35	.33	.37	.27
4. Roberts	.38	.39	.41	.33
5. Foxworth	.33	.47	.44	.29
6. Herrin	.39	.40	.43	.31
Average (Experts)	.37	.40	.41	.32
7. Gordon	.71	.43	.71	.38
8. Wideman	.49	.40	.45	.30
9. Wertenberger	.48	.40	.42	.38
10. McMenamin	.39	.45	.58	.34
11. McCoy	.63	.68	.59	.56
12. Coulas	.52	.78	.74	.51
13. Paille	.49	.37	.36	.34
Average (Av. Firers)	.53	.50	.55	.40
14. Paradise	.39	.46	.58	.46
15. Moffatt	.63	.66	.63	.57
16. Degan	.63	.47	.67	.82
Average (Recruits)	.55	.53	.63	.62
Average (All Firers)	.47	.47	.51	.41

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	1.14	1.26	.99	1.22	1.29	1.09	1.50	1.07	1.57	1.35	1.61	1.54
2. Grigg	.70	.99	.72	.61	.82	.90	.96	.71	.98	1.09	1.00	.78
3. White	.82	.84	.96	.66	.92	.95	.98	.80	1.08	1.18	1.28	.92
4. Roberts	.76	1.11	.71	.93	1.06	.93	1.26	.85	1.14	1.23	1.32	1.15
5. Foxworth	.77	1.34	.82	.60	.84	1.28	1.67	1.01	1.11	1.77	1.74	1.02
6. Herrin	.73	1.19	.76	.71	1.47	.90	1.18	.80	1.56	1.40	1.48	1.00
7. Gordon	1.60	1.12	2.03	1.04	1.48	.92	1.51	.94	1.80	1.33	2.38	1.25
8. Wideman	1.07	.96	.73	.73	1.43	1.10	1.61	.78	1.30	1.29	1.64	.91
9. Wertenberger	1.09	.92	1.04	.92	1.34	1.26	.93	.93	1.49	1.39	1.32	1.17
10. McMenamin	.75	1.15	1.07	.86	1.03	1.18	1.67	.96	1.18	1.52	1.78	1.13
11. McCoy	1.61	1.35	1.56	1.26	1.65	2.05	1.53	1.59	2.10	2.26	2.04	1.73
12. Coulas	1.08	1.85	1.76	1.39	1.53	1.75	2.09	1.24	1.69	2.30	2.33	1.71
13. Paille	1.47	.79	.64	.69	1.53	1.13	1.16	1.15	1.97	1.35	1.22	1.27
14. Paradise	.95	1.18	1.14	1.14	1.17	1.23	1.91	1.25	1.42	1.39	2.12	1.53
15. Moffatt	1.87	1.63	1.91	1.34	1.70	1.85	1.66	1.49	2.07	2.20	2.42	1.05
16. Degan	1.53	1.06	1.38	1.86	1.34	1.30	1.82	2.12	1.82	1.45	1.97	2.66
Average	1.12	1.17	1.14	1.00	1.29	1.24	1.47	1.11	1.52	1.53	1.73	1.30

Inclosure No. 3, T-6

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Prone. No time limit. 300 yards.

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Senechal	.76	.64	.77	.48
2. Grigg	.46	.57	.60	.39
3. White	.55	.56	.51	.36
4. Roberts	.59	.56	.50	.39
5. Foxworth	.50	.59	.64	.42
6. Herrin	.59	.55	.60	.31
Average (Experts)	.58	.58	.60	.39
7. Gordon	.62	.70	.74	.54
8. Wideman	.66	.66	.65	.50
9. Wertenberger	.75	.60	.70	.46
10. McMenamin	.57	.51	.62	.51
11. McCoy	.98	.68	.81	.64
12. Coulas	.86	1.09	.72	.72
13. Paille	.62	.53	.66	.46
Average (Av. Firers)	.72	.68	.70	.55
14. Paradise	.81	.77	.70	.54
15. Moffatt	.98	.90	.80	.70
16. Degan	.80	.76	.85	.91
Average (Recruits)	.86	.81	.78	.72
Average (All firers)	.69	.67	.68	.52

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	1.67	1.45	2.22	1.32	2.56	1.75	1.87	1.37	2.89	2.11	2.50	1.80
2. Grigg	1.17	1.30	1.45	.92	1.18	1.67	1.75	.95	1.37	1.88	1.65	1.13
3. White	1.32	.84	1.10	1.01	1.36	1.43	1.63	1.18	1.56	1.53	1.73	1.42
4. Roberts	.95	1.04	1.07	.81	1.85	1.42	1.39	1.09	1.94	1.55	1.46	1.16
5. Foxworth	1.15	1.25	1.50	1.03	1.67	1.85	1.80	1.16	1.85	1.95	2.03	1.35
6. Herrin	1.82	1.36	1.18	.66	1.52	1.68	1.96	1.04	2.06	2.06	2.09	1.18
7. Gordon	1.45	2.36	1.98	1.35	1.77	1.58	2.27	1.65	1.70	2.52	2.70	1.86
8. Wideman	1.86	1.45	1.46	1.10	1.82	1.92	1.97	1.53	2.26	2.13	2.04	1.81
9. Wertenberger	1.62	1.37	1.46	.91	2.39	1.55	2.03	1.30	2.27	1.89	2.29	1.48
10. McMenamin	1.51	1.26	1.76	1.59	1.56	1.60	1.44	1.09	1.72	1.77	2.03	1.64
11. McCoy	2.42	1.49	2.04	1.54	3.25	1.87	1.91	1.86	3.56	1.98	2.51	2.25
12. Coulas	1.85	2.39	1.71	2.04	2.35	3.77	2.40	1.77	2.75	3.69	2.60	2.53
13. Paille	1.40	1.13	1.38	.70	1.62	1.45	1.91	1.71	1.94	1.67	2.14	1.79
14. Paradise	1.70	1.88	1.38	1.23	2.28	2.09	2.05	1.55	2.50	2.66	2.22	1.75
15. Moffatt	2.12	2.62	1.71	1.84	2.12	2.23	2.21	1.76	2.74	2.79	2.51	2.44
16. Degan	2.04	2.25	1.74	2.27	2.10	1.72	2.19	2.17	2.64	2.50	2.64	3.25
Average	1.63	1.59	1.57	1.27	1.96	1.85	1.92	1.45	2.23	2.17	2.20	1.80

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NTIAL

Prone. No time limit. 500 yards

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2		FN		M-1		T-25	
1. Senechal	1.45		1.32		.96		.76	
2. Grigg	1.06		.82		.81		.64	
3. White	1.04		.84		.86		.49	
4. Roberts	1.21		.81		1.11		.48	
5. Foxworth	1.22		1.13		1.08		.59	
6. Herrin	.95		1.03		.90		.60	
Average (Experts)		1.16		.99		.95		.59
7. Gordon	.88		1.08		1.04		.74	
8. Wideman	1.22		.95		.84		.84	
9. Wertenberger	1.03		1.08		.89		.70	
10. McMenamin	1.17		.95		.93		.60	
11. McCoy	1.50		1.02		1.30		.88	
12. Coulas	1.07		1.27		1.35		.77	
13. Paille	.84		1.02		1.38		.58	
Average (Av. Firers)		1.10		1.05		1.10		.73
14. Paradise	1.09		1.20		1.19		.69	
15. Moffatt	1.19		1.35		1.09		1.14	
16. Degan	1.37		1.64		1.33		1.42	
Average (Recruits)		1.22		1.40		1.20		1.08
Average (All firers)	1.14		1.09		1.07		.75	

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	3.15	3.06	2.38	1.86	3.93	3.79	2.69	2.10	4.57	4.45	3.06	2.45
2. Grigg	2.62	2.24	1.40	1.30	2.93	2.34	2.35	1.87	3.43	2.95	2.41	2.15
3. White	2.16	2.17	2.14	1.16	2.95	2.63	2.29	1.29	3.80	3.18	2.90	1.50
4. Roberts	3.15	2.10	1.91	1.47	2.86	2.50	3.55	1.43	3.75	2.86	3.89	1.72
5. Foxworth	2.80	2.54	2.64	1.55	3.13	3.31	2.78	1.46	3.65	3.70	3.33	2.06
6. Herrin	2.47	1.93	2.21	1.53	2.31	3.00	2.34	1.67	3.11	3.42	2.71	2.05
7. Gordon	2.08	2.33	2.51	2.14	2.85	2.89	2.86	1.69	3.25	3.33	3.36	2.45
8. Wideman	3.40	2.11	2.60	1.88	3.11	3.08	2.05	2.41	4.05	3.47	3.08	2.79
9. Wertenberger	2.21	2.33	2.11	1.53	3.01	2.95	2.39	1.97	3.45	3.65	2.87	2.30
10. McMenamin	2.61	2.29	2.03	1.28	2.95	2.73	2.56	1.94	3.37	3.38	2.84	2.29
11. McCoy	3.04	2.50	3.02	2.19	3.95	2.96	3.42	2.20	4.63	3.19	4.24	2.81
12. Coulas	2.42	2.91	3.03	2.19	2.84	3.49	3.43	1.88	3.36	3.93	4.08	2.58
13. Paille	2.01	2.71	2.20	1.30	2.28	3.13	3.26	1.51	2.79	3.66	3.52	1.81
14. Paradise	3.00	2.83	2.52	1.66	2.74	2.56	3.35	1.67	4.03	3.44	3.72	2.20
15. Moffatt	2.60	2.92	3.20	2.85	3.53	4.12	2.91	3.08	4.05	4.66	3.75	3.76
16. Degan	3.21	4.36	3.31	3.66	3.86	4.15	2.84	3.55	4.54	5.01	3.82	4.53
Average	2.68	2.58	2.45	1.85	3.08	3.10	2.82	1.98	3.74	3.64	3.35	2.47

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Sustained Firing. Prone. 25 Seconds per shot group. 100 yards.
Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2		FN		M-1		T-25	
1. Senechal	.31		.33		.33		.17	
2. Grigg	.26		.19		.23		.14	
3. White	.31		.21		.21		.13	
4. Roberts	.27		.27		.28		.20	
5. Foxworth	.25		.31		.29		.22	
6. Herrin	.31		.24		.20		.16	
Average (Experts)		.29		.26		.26		.17
7. Gordon	.37		.37		.37		.31	
8. Wideman	.25		.20		.28		.19	
9. Wertenberger	.26		.27		.25		.22	
10. McMenamin	.35		.25		.26		.24	
11. McCoy	.48		.31		.37		.33	
12. Coulas	.36		.35		.44		.24	
13. Paille	.23		.26		.23		.18	
Average (Av. Firers)		.33		.28		.31		.24
14. Paradise	.25		.39		.26		.18	
15. Moffatt	.48		.48		.42		.23	
16. Degan	.40		.31		.41		.30	
Average (Recruits)		.38		.39		.37		.24
Average (All Firers)	.32		.29		.30		.22	

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	.58	.82	.75	.36	.99	.89	.94	.49	1.08	1.05	1.09	.56
2. Grigg	.63	.37	.52	.24	.74	.40	.55	.36	.94	.54	.73	.40
3. White	.58	.45	.48	.24	.61	.63	.53	.37	.80	.74	.64	.40
4. Roberts	.65	.67	.48	.37	.69	.56	.74	.53	.92	.80	.75	.58
5. Foxworth	.43	.49	.64	.56	.75	.82	.65	.36	.81	.98	.78	.64
6. Herrin	.42	.61	.40	.39	.61	.46	.51	.42	.71	.71	.59	.52
7. Gordon	.78	.71	.84	.81	1.14	.77	.76	.69	1.27	1.02	1.07	.88
8. Wideman	.64	.42	.53	.39	.61	.59	.67	.51	.83	.67	.90	.61
9. Wertenberger	.59	.67	.47	.47	.65	.72	.78	.53	.82	.92	.79	.60
10. McMenamin	.58	.62	.62	.55	.87	.57	.56	.57	.78	.98	.82	.82
11. McCoy	1.27	.53	.84	.63	1.30	.80	.79	1.02	1.61	.98	1.16	1.11
12. Coulas	1.02	.74	1.21	.55	.85	.95	.88	.61	1.03	1.14	1.40	.70
13. Paille	.48	.40	.46	.31	.62	.60	.62	.54	.75	.68	.65	.57
14. Paradise	.50	1.05	.66	.49	.80	.84	.69	.45	.94	1.23	.84	.59
15. Moffatt	.90	.86	.92	.51	.77	1.00	1.00	.59	1.33	1.38	1.23	1.67
16. Degan	.93	.74	.96	.82	1.01	.88	.62	.59	1.37	1.02	1.17	.97
Average	.69	.63	.67	.48	.81	.72	.71	.54	1.00	.93	.91	.66

Inclosure No. 4, T-6

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Prone. Sustained Firing. 25 Seconds per shot group. 200 yards

Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Senechal	.57	.48	.62	.35
2. Grigg	.57	.52	.61	.31
3. White	.40	.43	.41	.33
4. Roberts	.39	.44	.46	.34
5. Foxworth	.43	.49	.36	.47
6. Herrin	.40	.39	.50	.33
Average (Experts)	.46	.46	.49	.36
7. Gordon	.66	.57	.49	.49
8. Wideman	.54	.61	.46	.44
9. Wertenberger	.53	.54	.54	.39
10. McMenamin	.52	.64	.59	.46
11. McCoy	.69	.54	.56	.50
12. Coulas	.59	.53	.61	.54
13. Paille	.55	.55	.64	.50
Average (Av. Firers)	.58	.57	.56	.47
14. Paradise	.70	.55	.66	.44
15. Moffatt	.63	.71	.62	.53
16. Degan	1.02	.59	.74	.64
Average (Recruits)	.78	.62	.67	.54
Average (All Firers)	.57	.54	.55	.44

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	1.54	1.06	1.43	.80	1.30	1.30	1.73	.85	1.60	1.60	1.93	1.03
2. Grigg	.84	1.17	.89	.66	1.28	1.45	1.42	.61	1.38	1.73	1.54	.77
3. White	1.00	.91	1.06	.62	.99	1.03	1.05	1.04	1.26	1.18	1.31	1.17
4. Roberts	1.00	1.15	1.30	.77	.87	.87	.90	.81	1.19	1.35	1.36	.95
5. Foxworth	.78	1.17	.92	.91	1.23	1.28	.89	.99	1.40	1.44	.96	1.32
6. Herrin	.79	.79	1.19	.73	1.13	.97	1.17	.79	1.42	1.12	1.67	.98
7. Gordon	1.47	1.42	1.09	1.19	1.66	.97	1.03	1.03	2.47	1.77	1.41	1.66
8. Wideman	.91	1.59	.88	.74	1.49	1.35	1.18	.95	1.51	1.77	1.57	1.20
9. Wertenberger	1.18	1.11	1.24	1.08	1.42	1.44	1.22	.76	1.60	1.71	1.45	1.31
10. McMenamin	1.27	1.59	1.01	1.05	1.33	1.50	1.39	1.28	1.87	1.77	1.84	1.40
11. McCoy	1.58	1.79	1.49	1.14	1.88	1.51	1.15	1.13	2.23	2.08	1.64	1.42
12. Coulas	1.14	1.35	1.61	.95	1.63	1.40	1.39	1.48	1.72	1.65	1.93	1.69
13. Paille	1.51	1.36	1.04	.84	1.62	1.46	2.12	1.42	2.02	1.78	2.20	1.31
14. Paradise	1.61	1.30	1.39	1.24	1.72	1.45	1.45	.96	2.09	1.66	1.79	1.49
15. Moffatt	1.53	1.82	1.72	1.42	2.39	1.88	1.36	1.26	2.55	2.27	1.93	1.77
16. Degan	1.19	1.12	1.66	1.19	1.62	1.32	1.54	1.61	2.25	1.80	2.15	1.75
Average	1.21	1.29	1.25	.96	1.47	1.32	1.31	1.06	1.79	1.67	1.67	1.33

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Prone. Sustained Firing. 25 seconds per shot group. 300 yards
Mean Radius in feet. Average of 6 shot groups per type rifle.

	EM-2	FN	M-1	T-25
1. Senechal	1.08	.92	.41	.62
2. Grigg	.65	.55	.75	.39
3. White	.88	.63	.63	.46
4. Roberts	.67	.73	.72	.47
5. Foxworth	.66	.74	.63	.54
6. Herrin	.65	.65	.65	.49
Average (Experts)	.76	.70	.63	.50
7. Gordon	.90	.93	.88	.70
8. Wideman	.66	.67	.67	.54
9. Wertenberger	.94	.87	.66	.54
10. McMenamin	.72	.70	.69	.63
11. McCoy	1.25	.88	1.08	.74
12. Coulas	.71	1.06	1.17	.55
13. Paille	.96	.79	.92	.57
Average (Av. Firers)	.88	.84	.87	.61
14. Paradise	.86	.84	.80	.69
15. Moffatt	1.01	1.03	1.01	.79
16. Degan	1.27	.91	1.01	.78
Average (Recruits)	1.05	.93	.94	.75
Average (All Firers)	.87	.81	.79	.59

Same shot groups as above. Maximum Horizontal and Vertical Dispersion and Maximum Spread (in feet).

	Maximum Horizontal Dispersion				Maximum Vertical Dispersion				Maximum Spread			
	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25	EM-2	FN	M-1	T-25
1. Senechal	2.22	1.86	1.93	1.37	2.23	2.04	1.77	1.17	3.09	2.53	2.42	1.72
2. Grigg	1.23	1.22	1.07	.79	1.54	1.54	2.47	1.09	1.74	1.84	2.56	.90
3. White	2.15	1.35	1.93	.91	2.03	1.35	1.65	1.38	2.80	1.78	2.02	1.62
4. Roberts	1.55	1.74	1.69	.91	1.80	1.53	1.88	1.31	2.22	2.00	2.40	1.46
5. Foxworth	1.45	1.25	1.70	1.10	1.70	1.98	1.37	1.26	1.74	2.23	2.29	1.53
6. Herrin	1.24	1.74	1.18	.93	1.53	1.31	1.58	1.17	1.87	1.95	1.71	1.55
7. Gordon	1.40	1.51	2.17	1.81	2.31	1.93	2.09	1.41	2.56	2.36	2.92	2.08
8. Wideman	1.37	1.20	1.16	1.57	1.71	1.45	1.82	.83	1.95	1.75	2.17	1.67
9. Wertenberger	1.46	1.93	1.10	1.19	2.59	1.95	1.58	1.52	2.91	2.74	1.84	1.80
10. McMenamin	1.53	1.81	1.62	1.77	1.98	1.86	1.82	1.38	2.27	2.49	2.33	2.16
11. McCoy	2.35	2.00	1.88	1.81	2.42	2.16	1.85	1.71	3.11	2.86	2.88	2.38
12. Coulas	1.56	2.17	2.56	1.34	1.79	2.32	3.06	1.36	2.20	2.63	3.72	1.75
13. Paille	1.83	1.35	1.55	1.22	2.22	1.98	1.60	1.52	2.83	2.27	2.09	1.72
14. Paradise	2.22	2.32	2.37	1.62	2.06	1.87	1.57	1.46	2.64	2.73	2.64	1.92
15. Moffatt	1.88	2.21	2.05	1.81	2.07	2.16	2.01	1.63	2.53	2.82	2.62	2.21
16. Degan	1.93	2.02	2.20	1.91	2.70	1.73	1.99	1.32	3.12	2.44	2.65	2.21
Average	1.71	1.73	1.76	1.38	2.04	1.82	1.88	1.35	2.47	2.34	2.45	1.79

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Heated Barrel Test. Displacement of Center of Impact

	EM-2					
	2nd		3rd		4th	
Foxworth	.54 R	.94 D	.13 R	.67 D	1.29 L	1.30 U
	.77 R	1.04 D	.52 R	.49 D	.73 R	.50 D
Prestridge			.33 L	2.48 D	.17 L	2.50 D
	.40 R	.75 D	.80 L	.12 U	.21 R	.34 U
Roberts	1.16 R	3.72 D	.72 R	3.11 D	.28 R	3.06 D
	.47 L	.78 D	.07 L	1.30 D	.20 R	1.45 D
White	1.64 R	2.21 D	1.18 R	1.52 D	1.13 R	1.36 D
	.40 R	4.08 D	.64 R	3.81 D	1.00 R	3.81 D
Herrin	.14 L	.64 D	.71 L	.52 D	.09 L	.36 D
	.27 L	.93 D	1.05 L	1.13 D	.15 L	1.63 D
Thwaites	.01 L	1.02 D	.25 L	.38 D	.32 L	.04 D
	.01 R	.80 D	.07 L	.40 D	.08 R	.82 D
	.32 R	1.54 D	.07 L	1.31 D	.10 R	1.16 D
	Average .12 R/1.30 D					

	FN					
	2nd		3rd		4th	
Foxworth	.09 L	1.91 D	.10 L	2.17 D	.18 R	1.47 D
	.51 L	.98 D	.54 L	.99 D	.46 L	.91 D
Prestridge	.21 R	1.85 D	.06 L	.99 D	.37 L	1.55 D
	1.44 R	1.30 D	.89 R	1.50 D	.96 R	1.70 D
Roberts	.32 R	.45 U	.23 L	.73 U	.33 R	.28 U
	.48 R	.07 D	.51 R	.53 D	.80 R	.42 D
White	.12 L	1.66 D	.01 L	2.00 D	.15 L	1.63 D
	.36 L	1.34 D	.04 L	.57 D	.25 D	1.02 D
Herrin	.83 R	1.69 D	.83 R	.65 D	1.18 R	.70 D
	.44 L	.84 D	.29 L	1.13 D	.60 L	1.37 D
Thwaites	.85 R	2.35 D	.95 R	2.80 D	1.16 R	3.07 D
	.20 L	1.22 D	.08 L	1.25 D	.10 R	.99 D
	.18 R	1.18 D	.08 R	1.15 D	.24 R	1.21 D
	Average .17 R/1.18 D					

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Heated Barrel Test. Displacement of Center of Impact

M-1

	2nd		3rd		4th	
Foxworth	.42 R	2.16 U	.14 R	2.25 U	.41 R	1.56 U
	.33 R	1.29 D	.70 R	1.40 D	.21 R	1.79 D
Prestridge	.11 L	1.04 D	.06 L	.45 D	.32 L	3.61 D
	.31 R	1.64 D	.41 R	1.49 D	.22 R	1.62 D
Roberts	.43 R	1.01 D	.58 R	.90 D	.30 R	1.45 D
	.64 L	.29 D	.89 L	.10 D	1.27 L	.84 U
White	.72 R	1.02 U	.40 R	1.25 U	.32 R	.86 U
	.72 R	.26 U	.59 R	1.06 D	.60 R	1.05 D
Herrin	.19 R	.71 D	.54 R	.17 D	.35 R	.23 U
	.23 R	.16 D	.17 R	.87 D	.29 R	.71 D
Thwaites	.63 R	.85 D	.16 R	.60 D	.58 R	.37 D
	.21 R	.02 D	.28 R	.61 U	.32 R	.92 U
	.29 R	.30 D	.25 R	.24 D	.17 R	.52 D

Average .24 R/.35 D

T-25

	2nd		3rd		4th	
Foxworth	.29 R	1.59 D	.29 R	.95 D	.34 R	.97 D
	.43 R	1.17 D	.21 R	.73 D	.13 R	.84 D
Prestridge	.26 R	.87 D	.11 L	.72 D	.27 L	1.11 D
	.10 L	1.57 D	.06 L	1.38 D	.19 R	.91 D
Roberts	.10 L	1.18 D	.27 L	1.01 D	.25 L	.62 D
	.27 L	.11 D	.22 L	.06 U	.53 L	.31 U
White	.78 R	1.31 D	.51 R	1.06 D	.06 R	1.08 D
	.33 R	1.25 D	.41 R	1.31 D	.06 R	1.04 D
Herrin	.31 R	1.51 D	.77 R	1.55 D	.20 R	1.41 D
	.34 L	1.65 D	.35 L	1.79 D	.29 L	1.51 D
Thwaites	.33 R	1.09 D	.46 R	.52 D	.17 R	.71 D
	.00 -	.89 D	.04 L	.67 D	.39 R	.63 D
	.16 R	1.18 D	.13 R	.97 D	.02 R	.88 D

Average .10 R/1.01 D

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Mean Radii. Heated Barrel Test.

Order	EM-2				FN			
	#1	#2	#3	#4	#1	#2	#3	#4
Prestridge	.48	.71	.49	.53	.77	.33	.58	.56
	.74	.54	.65	.63	.58	1.00	.54	1.18
Foxworth	.52	.76	.74	.42	.25	.41	.45	.63
	1.04	.78	.71	.77	.46	.44	.34	.47
Roberts	.32	.72	.38	.40	.49	.31	.88	.79
	.61	.80	.79	.53	.52	.50	.84	.40
Herrin	.69	.63	1.10	.60	1.10	.76	.60	.57
	.62	.50	.75	.50	.44	.60	.62	.67
White	.45	.55	.52	.42	.32	.49	.60	.48
	.40	.49	.74	.51	.39	.54	.58	.52
Thwaites	.50	.93	.62	.37	.56	.81	1.28	1.05
	.68	.40	.37	.44	.43	.46	.63	.54
Total	7.05	7.81	7.86	6.12	6.31	6.65	7.94	7.86
Average	.59	.65	.66	.51	.53	.55	.66	.66

Order	M-1				T-25			
	#1	#2	#3	#4	#1	#2	#3	#4
Prestridge	.38	.51	.49	.38	.26	.55	.44	.35
	.50	.69	.53	.95	.35	.46	.58	.51
Foxworth	.65	.85	.85	.47	.46	.31	.33	.48
	.54	.89	.88	.54	.34	.33	.33	.37
Roberts	.43	.57	.86	.39	.42	.44	.32	.44
	.50	.58	.67	.51	.48	.39	.51	.35
Herrin	.59	.53	.78	.51	.33	.71	.44	.34
	.89	.80	.76	.68	.34	.30	.35	.64
White	.53	.38	.55	.45	.31	.26	.45	.38
	.53	1.00	.71	.44	.27	.31	.31	.23
Thwaites	.47	.74	.69	.36	.31	.38	.33	.44
	.53	.56	.45	.51	.28	.33	.30	.28
Total	6.54	8.10	8.22	6.19	4.15	4.77	4.69	4.81
Average	.55	.68	.69	.52	.35	.40	.39	.40

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Firing with attachments. Displacement of Center of Impact

EM-2

	Foxworth			Martin		
	H	V	MR	H	V	MR
w/o Attachments			.72			.68
w/Grenade Launcher	1.73 L	3.31 U	.44	.14 L	.43 U	.48
w/Bayonet	.26 L	4.47 U	.64	.39 R	.85 U	.67

	White			Grigg		
	H	V	MR	H	V	MR
w/o Attachments			.48			.65
w/Grenade Launcher	.04 R	1.54 D	.53	.22 L	.83 D	.66
w/Bayonet	.55 R	.30 D	.45	.96 R	.08 U	.87

	Senechal			Roberts		
	H	V	MR	H	V	MR
w/o Attachments			.45			.55
w/Grenade Launcher	.37 L	1.05 U	.39	.35 L	.30 U	.32
w/Bayonet	.27 R	1.26 U	.64	.60 R	.07 U	.47

	Prestridge			Herrin		
	H	V	MR	H	V	MR
w/o Attachments			.63			.62
w/Grenade Launcher	1.10 L	.14 U	.53	1.20 L	.54 U	.59
w/Bayonet	.12 R	.16 U	.70	.43 L	2.84 U	.57

	Thwaites			Average		
	H	V	MR	H	V	MR
w/o Attachments			.61			.59
w/Grenade Launcher	.94 L	.33 U	.44	.67 L	.41 U	.49
w/Bayonet	.19 L	1.55 U	.49	.22 R	1.22 U	.61

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Firing with attachments. Displacement of Center of Impact.

FN

	Foxworth			Martin		
	H	V	MR	H	V	MR
w/o Attachments			.68			.61
w/Bayonet	.35 R	.53 D	.82	2.74 R	.99 U	.30
w/Grenade Launcher	2.14 L	.43 D	1.19	.78 L	.67 U	.77
w/Bayonet & F. Hider	.72 L	.63 D	.69	.40 R	1.75 D	.71
w/Flash Hider	.02 L	1.77 D	.86	.22 R	3.73 D	.63
w/Recoil Check	.10 L	2.03 D	.41	.73 R	2.11 D	.55

	White			Grigg		
	H	V	MR	H	V	MR
w/o Attachments			.52			.59
w/Bayonet	.08 L	1.28 D	.54	.56 L	1.84 D	.61
w/Grenade Launcher	.02 L	.72 U	.91	.73 L	.11 U	.49
w/Bayonet & F. Hider	.61 L	1.68 D	.61	.75 L	1.47 D	.55
w/Flash Hider	.65 L	2.03 D	.70	.64 L	1.52 D	.47
w/Recoil Check	.31 L	2.05 D	.27	.37 L	1.60 D	.38

	Senechal			Roberts		
	H	V	MR	H	V	MR
w/o Attachments			.53			.55
w/Bayonet	.15 L	1.38 D	.40	.41 R	.39 D	.52
w/Grenade Launcher	.35 L	2.57 U	.72	.62 L	1.88 U	.69
w/Bayonet & F. Hider	.25 L	2.00 D	.66	.36 R	1.53 D	.35
w/Flash Hider	.24 L	2.02 D	.24	.16 R	1.33 D	.46
w/Recoil Check	.32 L	1.92 D	.63	.01 R	1.56 D	.38

	Prestridge			Herrin		
	H	V	MR	H	V	MR
w/o Attachments			.80			.72
w/Bayonet	.53 L	1.86 U	.30	.76 R	.73 U	.79
w/Grenade Launcher	.02 R	1.23 U	.76	1.50 R	.14 D	.99
w/Bayonet & F. Hider	.49 L	1.88 D	.78	.55 L	2.43 D	.52
w/Flash Hider	.01 R	1.04 D	.64	.87 L	2.89 D	.52
w/Recoil Check	.73 L	1.96 D	.34	.17 L	.46 D	.54

	Thwaites			Average		
	H	V	MR	H	V	MR
w/o Attachments			.47			.61
w/Bayonet	1.98 R	3.60 D	.67	.55 R	.60 D	.55
w/Grenade Launcher	.29 L	.48 D	.82	.38 L	.68 U	.82
w/Bayonet & F. Hider	1.69 R	3.64 D	.65	.10 L	1.67 D	.61
w/Flash Hider	1.84 R	4.58 D	.40	.02 L	2.32 D	.55
w/Recoil Check	----	----	---	.28 L	1.71 D	.44

Inclosure No. 6, T-6

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Firing with attachments. Displacement of Center of Impact.

M-1

	Prestridge			Herrin		
	H	V	MR	H	V	MR
w/o Attachments			.57			.95
w/Bayonet	.07 R	.17 D	1.29	.87 L	1.12 U	1.28
w/Flash Hider	.21 R	.76 D	.58	.27 L	1.59 U	.61
w/Grenade Launcher	.12 R	.43 U	.83	.09 L	.18 U	.66

	Thwaites			Senechal		
	H	V	MR	H	V	MR
w/o Attachments			.65			.74
w/Bayonet	.24 L	1.00 U	.50	1.46 L	1.49 U	.59
w/Flash Hider	.01 R	.89 D	.48	1.08 L	.67 U	.64
w/Grenade Launcher	.28 L	1.53 U	.64	1.97 L	1.16 U	.61

	Roberts			Foxworth		
	H	V	MR	H	V	MR
w/o Attachments			.61			.53
w/Bayonet	.38 L	2.12 U	.59	.37 L	1.26 U	.68
w/Flash Hider	.53 R	2.04 U	.74	.06 R	2.37 U	.75
w/Grenade Launcher	.22 R	.97 D	.56	.04 L	1.10 D	.47

	Herbert			Martin		
	H	V	MR	H	V	MR
w/o Attachments			.31			.51
w/Bayonet	.15 L	1.95 U	.64	.35 L	.05 D	1.19
w/Flash Hider	.18 L	.14 U	.47	.22 L	1.39 U	.56
w/Grenade Launcher	.43 L	1.62 U	.66	.17 L	1.85 D	.40

	White			Grigg		
	H	V	MR	H	V	MR
w/o Attachments			.55			.53
w/Bayonet	.55 L	1.97 U	1.05	.76 R	.68 D	.98
w/Flash Hider	.21 L	3.53 U	.77	.87 L	1.60 U	.58
w/Grenade Launcher	.49 R	.11 U	.51	1.77 L	.90 D	.71

	Average		
	H	V	MR
w/o Attachments			.60
w/Bayonet	.35 L	1.00 U	.87
w/Flash Hider	.20 L	1.17 U	.62
w/Grenade Launcher	.38 L	.26 U	.61

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Firing with attachments. Displacement of Center of Impact.

T-25

	Prestridge			Herrin		
	H	V	MR	H	V	MR
w/o Attachments			.34			.26
w/Bayonet	.92 L	4.09 U	.31	.31 L	3.44 U	.40
w/Grenade Launcher	.61 L	1.45 U	1.03	.23 R	2.35 U	.42

	Thwaites			Senechal		
	H	V	MR	H	V	MR
w/o Attachments			.47			.59
w/Bayonet	.14 L	3.79 U	.30	.13 R	3.92 U	.50
w/Grenade Launcher	.17 L	1.67 U	.31	.04 R	2.75 U	.41

	Roberts			Foxworth		
	H	V	MR	H	V	MR
w/o Attachments			.45			.36
w/Bayonet	.20 R	3.53 U	.45	.26 L	5.11 U	.37
w/Grenade Launcher	.22 R	2.09 U	.40	.01 L	3.03 U	.34

	Herbert			Martin		
	H	V	MR	H	V	MR
w/o Attachments			.23			.33
w/Bayonet	.46 L	4.40 U	.38	.59 R	2.06 U	.42
w/Grenade Launcher	.21 L	1.30 U	.32	.05 L	2.69 U	.34

	White			Grigg		
	H	V	MR	H	V	MR
w/o Attachments			.34			.37
w/Bayonet	.93 L	4.04 U	.27	1.49 L	3.30 U	.37
w/Grenade Launcher	.29 L	1.34 U	.28	.51 L	1.72 U	.38

	Average		
	H	V	MR
w/o Attachments			.37
w/Bayonet	.36 L	3.77 U	.38
w/Grenade Launcher	1.36 L	2.04 U	.42

Inclosure No. 6, T-6

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Test No. 7

1. To determine the comparative accuracy of the rifles when firing automatic fire from a prone position with a muzzle and elbow rest with cool and hot barrels.

2. Method:

a. Sixteen men previously trained in automatic fire fired two rifles of each type of test rifle equipped with a bipod mount at ranges of 25, 100 and 200 yards.

b. Each rifleman fired three 10 round groups with each rifle at each range in bursts of two and three rounds, in bursts of five rounds, and 3 groups in bursts of 20 rounds.

c. As all shots did not hit the target, the percentage of hits only was computed for the 5 and 20 round bursts at 200 yards.

d. Mean radius, maximum horizontal, maximum vertical, maximum spread and change in the center of impact were recorded.

e. The rifles were refired at 50 yards in 2 and 3 round bursts after they had been preheated by firing eighty rounds in twenty round bursts. Prior to heating, the weapons were fired to establish centers of impact with cool barrel.

f. In order to compare the T-25 equipped with a heavy barrel with present standard automatic rifles (Bren and BAR), and to compare the Bren, BAR and T-25 (HB) with the test rifles, six firers fired 3 groups each of two and three round bursts, 5 round bursts and 20 round bursts at a range of 100 and 200 yards. At 200 yards the 20 round bursts were omitted.

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3. Results:

a. Accuracy, Test Weapons Cool Barrel

Range in Yards, other data in feet

Range	EM-2 MR	EM-2 MH	EM-2 MV	EM-2 MS	FN MR	FN MH	FN MV	FN MS	T-25 MR	T-25 MH	T-25 MV	T-25 MS
2 and 3 Round Bursts												
25	.25	.56	.57	.78	.18	.54	.36	.63	.17	.44	.34	.53
100	1.03	2.24	2.12	2.85	.65	1.73	1.35	2.10	.67	1.55	1.56	2.03
200	1.70	3.65	2.89	4.40	1.25	3.07	2.30	3.61	1.54	3.39	2.71	4.05
5 Round Burst												
25	.27	.69	.61	.85	.25	.69	.49	.80	.23	.58	.47	.71
100	1.13	2.88	2.07	3.39	.91	2.44	1.71	2.81	.87	2.26	1.76	2.75
200	77.2% Hits				80.6% Hits				72.7% Hits			
20 Round Burst												
25	.23	.72	.65	.93	.31	.91	.61	1.08	.31	.95	.57	1.13
100	.98	3.07	2.43	3.59	.99	2.85	2.21	3.38	.96	2.66	2.14	3.23
200	74% Hits				69.7% Hits				59.5% Hits			

Figure No. 1

b. Comparative Accuracy, Hot and Cool Barrels, Test Weapons

50 Yards - 2 and 3 Round Bursts. Data in Feet.

Rifle	Change in MR: MR Cool	MR Hot	Change in Center of Impact: Right	Left	Up	Down
EM-2	.49	.47	.11	----	----	.20
FN	.48	.45	.16	----	----	.27
T-25	.29	.35	----	.02	----	.19

Figure No. 2

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c. Accuracy, BAR, Bren and T-25 (Heavy Barrel)

Range in Yards. MR, MH, MV & MS in Feet.

Range	MR			MH			MV			MS		
	BAR	BREN	T25 HB	BAR	Bren	T25 HB	BAR	Bren	T25 HB	BAR	Bren	T25 HB
2 & 3 Round Bursts												
100	.43	.34	.51	1.27	.96	1.53	.79	.71	.78	1.46	1.10	1.66
200	.75	.68	.78	1.90	1.87	2.33	1.73	1.73	1.40	2.51	2.19	2.58
5 Round Bursts												
100	.69	.45	.65	2.08	1.23	2.06	1.29	.88	1.05	2.31	1.47	2.34
200	.91	.99	1.11	2.09	2.53	2.88	2.06	2.06	2.08	2.60	2.83	3.37
20 Round Bursts												
100	.52	.44	.69	1.62	1.34	2.08	1.45	1.09	1.64	1.97	1.61	2.51

Figure No. 3

d. Detailed results of accuracy firing with cold barrel are in Inclosure 1.

e. Detailed results of hot barrel firing are in Inclosure 2.

f. Detailed results of the accuracy firing of the BAR, Bren and T-25 HB are in Inclosure 3.

g. A typical group fired by each rifle at 100 yards is charted in Figure 4.

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4. Analysis

a. At all ranges and lengths of bursts fired the three test rifles have about the same accuracy. (See Graph, Fig 5 and 6)

b. None of the test rifles is as accurate as the BAR, Bren or T25 (heavy barrel) under the conditions of the test. In comparison the Bren is 50% more accurate than the best of the test rifles at all ranges and rates of fire tested. The T25 (Heavy Barrel) is 25 to 30% more accurate than the best of the test rifles at all the ranges and rates of fire tested. (See Graph, Fig 5 & 6).

c. The changes in MR and CI between cool and hot barrels are insignificant.

d. Of the 3 light machine guns, the Bren is the most accurate followed by the BAR and the T25 (heavy barrel). (See Graph, Fig 5 and 6)

e. The automatic fire accuracy of the test rifles (as light rifles) is acceptable for interim use but in no case does it meet the military characteristic requirements.

f. Limited firing of the T-25 (heavy barrel) indicates that the accuracy of the light rifles may be improved by adding a heavy barrel. (Appendix F-10)

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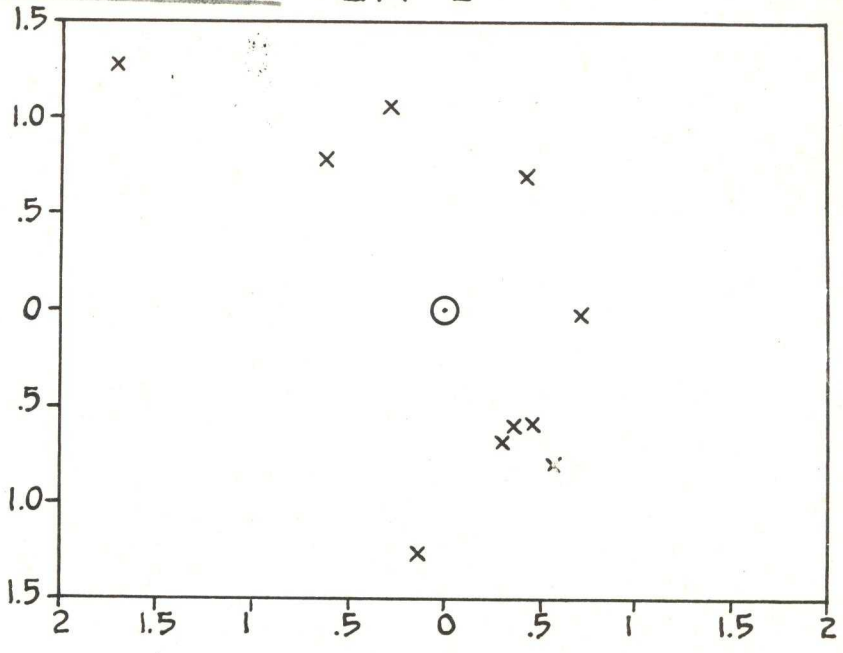
TEST 7
TYPICAL SHOT GROUPS

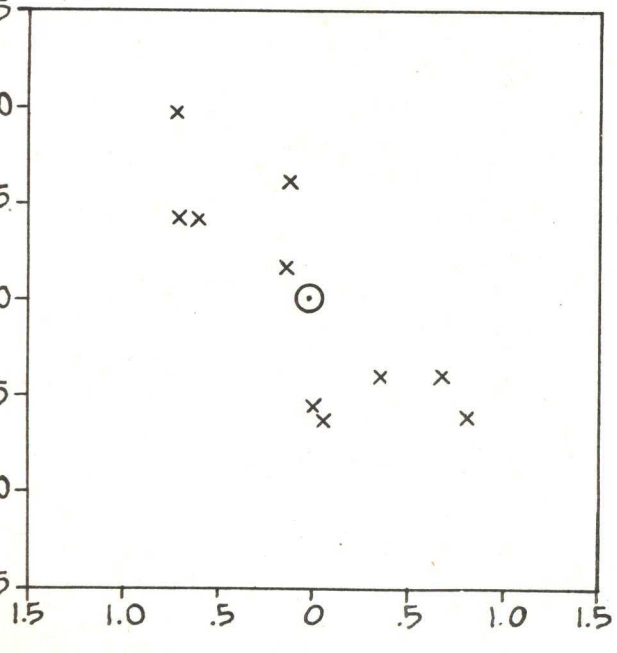
100 YARDS
2 & 3 ROUND BURSTS
PRONE - BIPOD -
COOL BARREL

DISPERSION IN FEET
⊙ = CENTER OF IMPACT

EM-2



FN



T-25

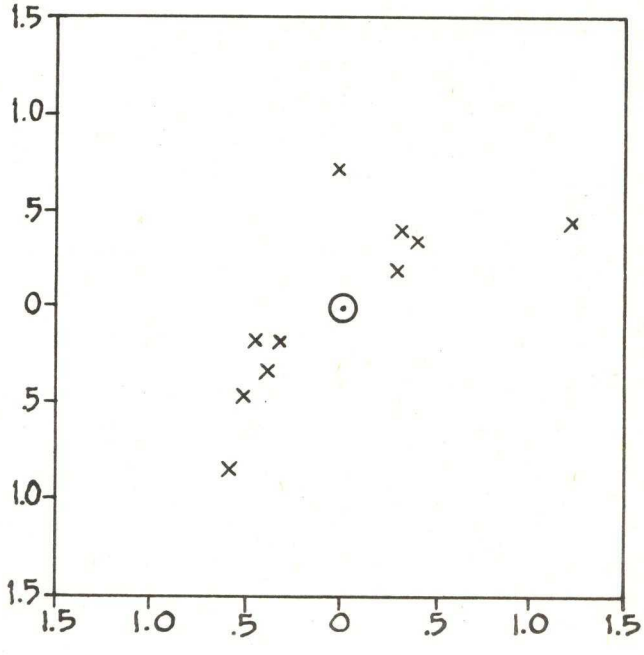


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FIG. 4

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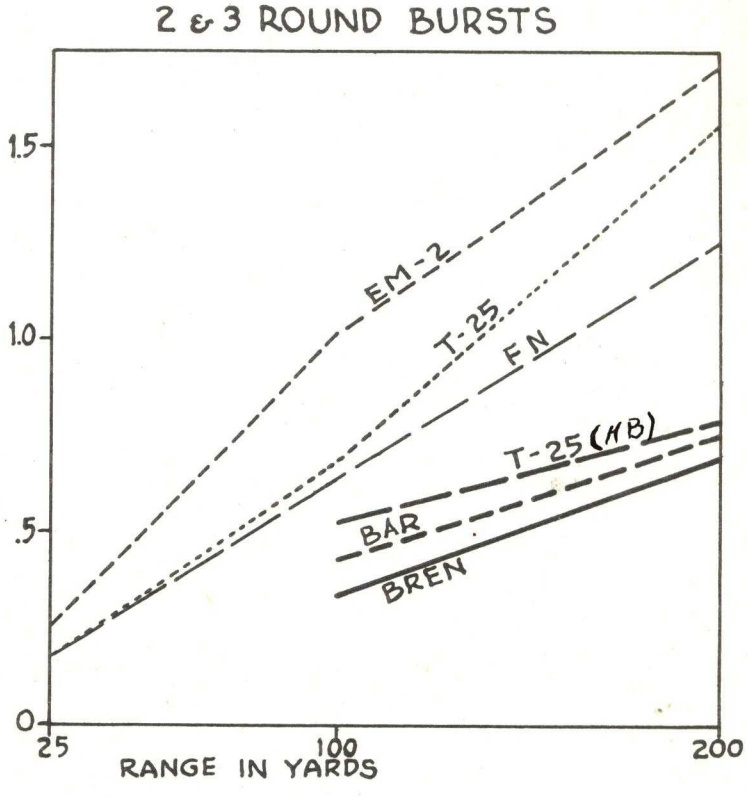
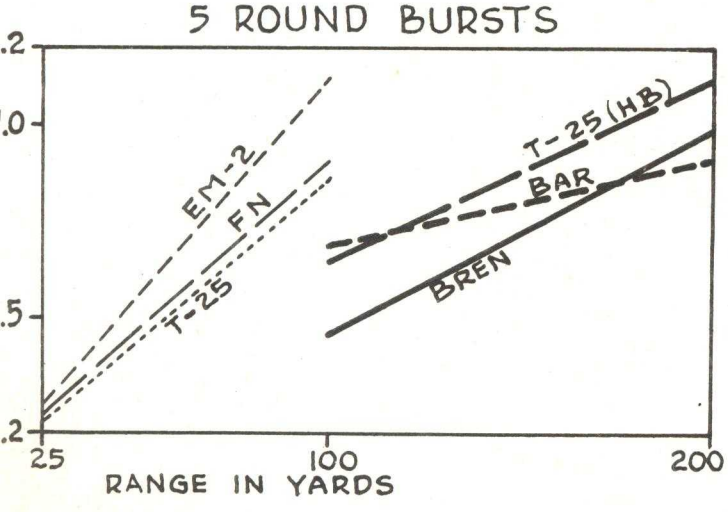
TEST 7
RANGE VS ACCURACY
AUTOMATIC FIRE

TEST WEAPONS VS BREN, BAR, & T-25 W/HEAVY BARREL

PRONE – BIPOD – COOL BARREL

MEAN RADII IN FEET





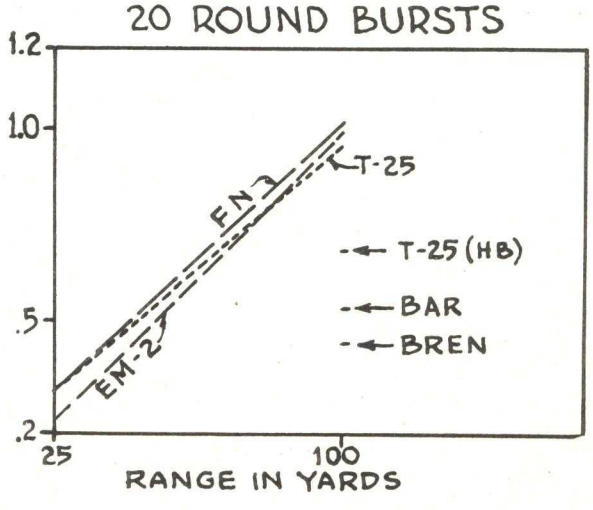


FIG. 5

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TEST 7

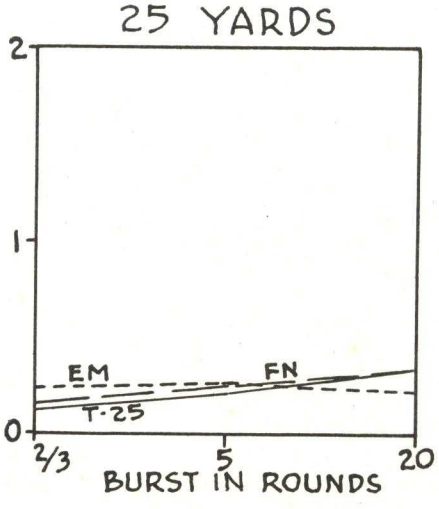
RATES VS ACCURACY IN AUTOMATIC FIRE

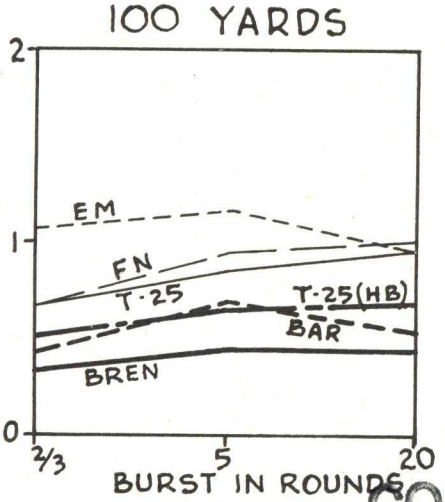
PRONE - BIPOD - COOL BARREL

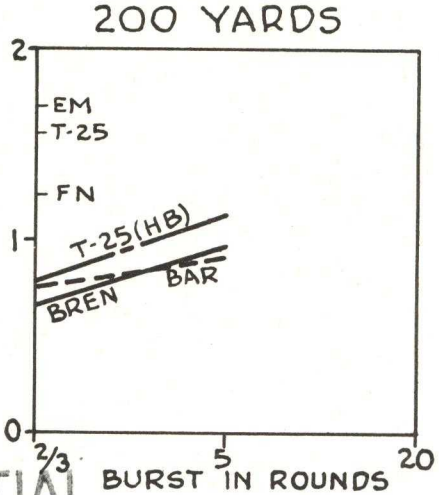
RATES OF FIRE IN ROUNDS PER MINUTE

MEAN RADII IN FEET

TEST WEAPONS VS BREN, BAR, AND T-25(H-B)







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Prone. 25 Yards, With Bipod. 2 & 3 Round Bursts

	EM-2	FN	T-25
Thwaites	.23	.08	.13
Roberts	.20	.15	.11
Martin	.16	.08	.10
White	.19	.22	.15
Grigg	.27	.11	.15
Foxworth	.24	.14	.18
Herrin	.28	.15	.23
MacIntyre	.24	.10	.14
Average (Experts)	.23	.13	.15
Gordon	.33	.21	.22
Paradis	.17	.20	.12
Wideman	.21	.13	.16
McMinamen	.43	.20	.16
Moffatt	.27	.18	.19
Cattral	.37	.33	.25
Wilson	.21	.28	.17
Wertenberger	.16	.24	.19
Average (other firers)	.27	.22	.18
Average (all firers)	.25	.18	.17

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	.45	.19	.28	.53	.21	.32	.67	.28	.37
Roberts	.45	.43	.29	.49	.39	.32	.64	.43	.41
Martin	.39	.23	.24	.38	.18	.22	.52	.27	.30
White	.45	.73	.54	.44	.41	.27	.57	.82	.60
Grigg	.43	.31	.37	.67	.27	.30	.73	.37	.46
Foxworth	.41	.37	.41	.52	.27	.42	.66	.47	.52
Herrin	.67	.36	.57	.54	.20	.33	.79	.40	.69
MacIntyre	.55	.24	.32	.64	.21	.33	.79	.27	.46
Gordon	.72	.59	.63	.69	.42	.32	.88	.68	.66
Paradis	.51	.48	.34	.43	.40	.28	.62	.62	.41
Wideman	.48	.52	.43	.47	.33	.32	.63	.73	.48
McMinamen	1.49	.70	.39	.48	.50	.45	1.53	.85	.56
Moffatt	.44	.54	.50	.94	.36	.30	1.08	.66	.56
Wilson	.35	.49	.45	.63	.69	.31	.74	.75	.55
Cattral	.92	1.25	.65	.83	.52	.53	1.08	1.35	.81
Wertenberger	.27	1.14	.59	.41	.37	.38	.48	1.18	.62
Average	.56	.54	.44	.57	.36	.34	.78	.63	.53

Inclosure No. 1, T-7

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Prone. 25 Yards with Bipod. 5 Round Bursts

	EM-2	FN	T-25
Thwaites	.23	.18	.16
Roberts	.26	.21	.20
Martin	.18	.18	.22
White	.30	.29	.26
Grigg	.36	.20	.41
Foxworth	.22	.21	.24
Herrin	.23	.20	.21
MacIntyre	.12	.16	.14
Average (Experts)	.24	.20	.23
Gordon	.32	.38	.18
Paradis	.23	.21	.15
Wideman	.25	.26	.31
McMinamen	.56	.30	.40
Moffatt	.24	.21	.17
Cattral	.46	.35	.33
Wilson	.20	.31	.23
Wertenberger	.20	.42	.14
Average (other firers)	.31	.31	.24
Average (all firers)	.27	.25	.23

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	.54	.43	.40	.57	.42	.40	.76	.54	.49
Roberts	.64	.50	.38	.63	.51	.44	.86	.67	.56
Martin	.27	.51	.58	.40	.39	.44	.54	.55	.65
White	.72	.96	.60	.71	.45	.49	.92	1.10	.72
Grigg	1.03	.52	.83	.86	.40	.77	1.17	.62	1.21
Foxworth	.52	.51	.61	.51	.48	.29	.66	.66	.69
Herrin	.66	.58	.58	.44	.33	.43	.75	.63	.71
MacIntyre	.26	.38	.38	.36	.38	.23	.39	.49	.41
Gordon	.86	.94	.45	.41	.82	.39	.90	1.11	.59
Paradis	.62	.43	.39	.55	.48	.35	.74	.64	.52
Wideman	.60	.74	.71	.51	.38	.71	.74	.79	.91
McMinamen	1.60	.82	1.26	1.00	.58	.56	1.58	.93	1.31
Moffatt	.68	.68	.37	.54	.44	.46	.79	.76	.57
Wilson	.45	.88	.60	.54	.58	.51	.60	1.03	.71
Cattral	1.11	.94	.70	1.22	.61	.77	1.54	1.04	.91
Wertenberger	.48	1.18	.38	.48	.54	.26	.62	1.25	.44
Average	.69	.69	.58	.61	.49	.47	.85	.80	.71

Inclosure No. 1, T-7

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Prone. 25 Yards with Bipod. 20 Round Bursts

	EM-2	FN	T-25
Thwaites	.16	.12	.12
Roberts	.26	.44	.31
Martin	.21	.19	.20
White	.25	.21	.34
Grigg	.20	.31	.33
Foxworth	.24	.23	.24
Herrin	.24	.14	.40
MacIntyre	.20	.49	.28
Average (Experts)	.22	.27	.28
Gordon	.25	.44	.31
Paradis	.26	.24	.18
Wideman	.19	.32	.36
McMinamen	.22	.49	.42
Moffatt	.26	.28	.45
Cattral	.27	.36	.37
Wilson	.27	.45	.26
Wertenberger	.17	.57	.44
Average (other firers)	.24	.39	.35
Average (all firers)	.23	.31	.31

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	.66	.31	.29	.55	.38	.35	.77	.47	.43
Roberts	.95	.47	.78	.85	.57	.65	1.14	.68	1.03
Martin	.64	.64	.58	.54	.27	.38	.92	.68	.71
White	.84	.70	1.14	.65	.26	.58	1.02	.77	1.28
Grigg	.51	.97	1.00	.63	.39	.35	.81	1.03	1.21
Foxworth	.56	.64	.66	.64	.49	.54	.83	.88	.82
Herrin	.82	.51	1.24	.82	.39	.55	1.09	.61	1.30
MacIntyre	.54	.86	.84	.56	.84	.61	.74	1.02	.98
Gordon	.93	1.09	1.34	.56	.91	.56	1.05	1.45	1.44
Paradis	.83	.86	.57	.67	.36	.39	1.01	.91	.69
Wideman	.61	.85	.76	.50	.80	.85	.71	1.07	1.16
McMinamen	.69	1.24	1.08	.74	1.11	.78	.97	1.72	1.50
Moffatt	.71	.98	1.32	.62	.60	.85	.88	1.10	1.56
Wilson	.76	1.61	.84	.85	.51	.41	1.04	1.71	.86
Cattral	.95	1.44	1.35	.77	.70	.80	1.28	1.51	1.60
Wertenberger	.52	1.45	1.48	.43	1.19	.49	.68	1.73	1.51
Average	.72	.91	.95	.65	.61	.57	.93	1.08	1.13

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Prone. 100 Yards with Bipod. 2 & 3 Round Bursts

	EM-2	FN	T-25
Thwaites	1.21	.30	.47
Roberts	.96	.56	.60
Martin	1.02	.34	.58
White	1.12	1.01	.74
Grigg	1.08	.48	.39
Foxworth	.96	.58	.57
Herrin	1.00	.80	.61
MacIntyre	.85	.33	.41
Average (Experts)	1.03	.55	.55
Gordon	.83	.84	.90
Paradis	1.08	.66	.69
Wideman	.91	.59	.44
McMinamen	1.39	.89	.76
Moffatt	.65	.74	.63
Cattral	1.47	.71	.99
Wilson	.97	.48	.94
Wertenberger	1.02	1.00	.80
Average (other firers)	1.04	.74	.77
Average (all firers)	1.03	.64	.66

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	2.34	.90	1.03	2.59	.70	1.12	3.37	1.04	1.36
Roberts	1.95	1.51	1.31	2.07	1.46	1.42	2.73	1.97	1.78
Martin	2.15	.70	1.25	2.39	.94	1.73	3.03	1.20	2.03
White	2.78	2.64	1.70	2.10	2.06	1.43	3.06	3.17	2.00
Grigg	1.46	1.71	1.09	3.00	.73	.94	3.11	1.83	1.22
Foxworth	2.01	1.97	1.79	1.77	1.01	1.13	2.45	2.10	2.00
Herrin	3.15	1.56	1.17	2.29	1.72	1.68	2.72	2.12	1.90
MacIntyre	2.11	.76	1.06	1.57	.84	1.18	2.44	1.05	1.35
Gordon	1.98	1.94	1.59	1.82	1.35	2.61	2.51	2.49	2.90
Paradis	2.44	1.59	1.59	2.36	1.34	1.53	3.34	1.84	1.99
Wideman	2.18	1.69	1.11	1.41	.98	1.30	2.36	1.76	1.58
McMinamen	2.44	2.33	2.00	2.74	2.73	2.03	3.33	3.28	2.79
Moffatt	1.49	2.09	1.57	1.62	1.07	1.38	2.16	2.47	1.76
Wilson	2.21	1.32	2.18	1.75	1.28	2.09	2.59	1.47	2.68
Cattral	2.72	2.32	2.29	2.47	1.22	1.76	3.37	2.58	2.67
Wertenberger	2.47	2.60	2.01	1.93	2.22	1.68	2.97	3.20	2.44
Average	2.24	1.73	1.55	2.12	1.35	1.56	2.85	2.10	2.03

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Prone. 100 Yards with Bipod. 5 Round Bursts

	EM-2	FN	T-25
Thwaites	.89	.48	.52
Roberts	1.10	.76	.60
Martin	1.13	.82	.79
White	1.33	.98	.91
Grigg	1.20	1.00	.96
Foxworth	.94	.70	1.08
Herrin	.80	.83	.61
MacIntyre	.72	.43	.92
Average (Experts)	1.01	.75	.80
Gordon	.87	1.01	.77
Paradis	1.42	.73	.62
Paille	1.53	1.35	1.00
McMinamen	1.59	1.35	1.40
Moffatt	1.01	.93	1.22
Cattral	1.21	.87	.83
Wilson	1.12	.87	.63
Wertenberger	1.25	1.29	.96
Average (other firers)	1.25	1.05	.93
Average (all firers)	1.13	.90	.86

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion,			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	2.15	1.31	1.18	1.94	1.08	1.46	2.57	1.43	1.78
Roberts	2.48	2.42	1.41	2.61	1.37	1.47	3.25	2.51	1.92
Martin	3.39	2.39	1.57	1.55	1.19	1.70	3.53	2.66	2.04
White	3.80	2.92	3.07	2.14	1.42	1.27	4.09	3.18	3.48
Grigg	2.77	2.66	2.23	2.27	1.96	2.00	3.58	2.97	2.85
Foxworth	2.97	1.69	3.08	1.78	1.36	1.58	3.18	2.31	3.34
Herrin	2.27	2.09	1.79	1.43	1.43	1.45	2.49	2.45	2.15
MacIntyre	2.01	.90	1.63	1.21	1.04	2.71	2.51	1.24	3.04
Gordon	1.89	2.63	2.05	1.65	1.99	1.75	2.33	2.84	2.37
Paradis	3.11	2.17	1.52	2.43	1.37	1.71	3.92	2.38	2.10
Paille	3.21	3.81	3.03	3.34	2.78	1.69	4.21	4.27	3.39
McMinamen	4.09	3.53	4.25	2.64	2.60	2.37	4.39	4.18	4.60
Moffatt	2.60	3.41	3.28	1.72	1.62	1.95	3.06	3.61	3.68
Cattral	2.91	2.19	2.15	2.52	1.90	1.51	3.58	2.71	2.38
Wilson	2.76	1.81	1.54	2.40	1.86	1.44	3.57	2.40	1.90
Wertenberger	3.71	3.11	2.36	1.51	2.43	2.07	3.94	3.74	2.96
Average	2.88	2.44	2.26	2.07	1.71	1.76	3.39	2.81	2.75

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Prone. 100 Yards with Bipod. 20 Round Bursts.

	EM-2	FN	T-25
Thwaites	.67	.52	1.10
Roberts	1.02	1.20	.95
Martin	.92	.81	.87
White	.69	.84	.71
Grigg	.79	1.64	.52
Foxworth	.86	.91	.91
Herrin	.92	.69	.67
MacIntyre	1.01	.74	1.51
Average (Experts)	.86	.92	.91
Gordon	.73	.90	.92
Paradis	1.23	.77	.63
Paille	1.42	1.08	1.07
McMinamen	1.20	1.31	1.10
Moffatt	1.08	.87	.86
Cattral	.98	1.30	1.14
Wilson	1.02	.91	1.40
Wertenberger	1.19	1.28	1.02
Average (other firers)	1.11	1.05	1.02
Average (all firers)	.98	.99	.96

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	2.90	1.52	2.89	2.24	1.33	2.14	3.86	1.87	3.41
Roberts	3.60	3.37	2.46	2.24	2.50	2.33	4.00	3.94	3.17
Martin	2.21	1.77	2.04	2.15	1.88	2.12	2.91	2.49	3.01
White	2.47	2.95	1.94	2.14	2.13	2.36	3.00	3.13	2.94
Grigg	2.51	3.33	1.79	2.24	2.07	1.23	2.85	3.68	2.19
Foxworth	3.52	2.95	2.25	2.03	2.14	2.05	3.84	3.36	2.98
Herrin	3.02	2.22	1.76	2.04	1.96	1.60	3.42	2.79	2.04
MacIntyre	2.59	2.24	3.62	2.61	2.00	3.82	2.95	2.69	4.40
Gordon	2.20	3.17	3.10	1.79	1.55	1.69	2.56	3.31	3.70
Paradis	3.66	2.39	1.78	2.41	2.10	1.36	3.90	2.77	2.19
Paille	4.13	3.86	3.69	2.65	2.52	1.99	4.73	4.39	3.84
McMinamen	3.08	3.33	2.87	2.66	3.17	1.88	3.88	4.49	3.17
Moffatt	2.33	2.43	2.57	2.61	1.90	2.49	3.27	3.11	3.03
Cattral	3.95	3.21	3.03	2.94	2.91	2.30	4.30	3.83	3.71
Wilson	3.10	3.06	3.80	2.64	1.95	2.22	3.50	3.54	4.21
Wertenberger	3.89	3.85	3.00	3.48	3.26	2.60	4.39	4.61	3.67
Average	3.07	2.85	2.66	2.43	2.21	2.14	3.59	3.38	3.23

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Prone. 200 Yards with Bipod. 2 & 3 Round Bursts

	EM-2	FN	T-25
Thwaites	1.40	.60	1.95
Roberts	1.40	1.14	.94
Martin	1.86	1.21	1.43
White	2.06	1.55	1.54
Grigg	1.68	1.07	1.33
Foxworth	1.58	1.57	1.38
Herrin	1.75	.96	1.33
MacIntyre	1.39	1.26	1.63
Average (Experts)	1.64	1.17	1.44
Gordon	1.59	1.60	1.54
Paradis	1.82	1.26	1.19
Paille	2.11	1.31	1.70
McMinamen	1.36	.98	1.55
Moffatt	1.38	1.47	2.04
Cattral	2.34	1.19	2.11
Wilson	1.62	1.10	1.30
Wertenberger	1.93	1.66	1.70
Average (other firers)	1.77	1.32	1.64
Average (all firers)	1.70	1.25	1.54

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Thwaites	3.43	1.48	4.59	2.54	1.59	3.41	3.94	2.03	5.06
Roberts	3.27	2.50	2.02	2.31	2.00	1.90	3.75	3.11	2.72
Martin	4.58	3.73	3.64	3.20	2.02	2.69	5.37	3.88	4.05
White	2.86	4.33	3.29	3.57	2.43	2.89	4.48	4.66	4.47
Grigg	3.76	2.72	3.72	3.31	2.06	2.26	4.55	3.25	4.18
Foxworth	2.18	4.04	2.90	3.08	2.37	1.68	3.52	4.44	3.43
Herrin	4.90	2.77	3.62	2.97	1.68	2.17	5.21	2.98	3.92
MacIntyre	3.17	3.12	2.90	2.18	2.72	2.38	3.54	3.60	3.23
Gordon	4.06	3.60	3.75	2.54	2.86	2.98	4.33	4.28	4.29
Paradis	4.22	1.86	2.39	2.64	1.83	2.37	4.79	2.37	3.04
Paille	3.35	2.66	3.43	3.12	2.44	3.17	4.35	3.49	4.20
McMinamen	3.72	2.32	2.27	2.06	2.44	2.70	3.81	3.06	3.38
Moffatt	2.71	4.38	4.46	2.65	2.76	4.05	3.64	4.96	5.49
Cattral	5.12	2.86	4.29	3.71	2.61	3.55	6.07	3.79	5.34
Wilson	3.35	2.36	3.07	3.24	2.14	2.39	4.34	3.03	3.42
Wertenberger	3.75	4.42	3.96	3.08	2.91	2.77	4.69	4.89	4.64
Average	3.65	3.07	3.39	2.89	2.30	2.71	4.40	3.61	4.05

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Prone. 200 Yards with Bipod. 5 Round Bursts

	EM-2		FN		T-25	
	Hits	Misses	Hits	Misses	Hits	Misses
Thwaites	21	9	30	0	14	16
Roberts	27	3	26	4	23	7
Martin	27	3	18	12	30	0
White	26	4	26	4	18	12
Grigg	26	4	25	5	20	10
Foxworth	28	2	29	1	29	1
Herrin	30	0	30	0	28	0
MacIntyre	28	2	28	2	27	3
Gordon	24	6	30	0	27	3
Paradis	25	5	23	7	17	13
Paille	19	11	20	10	22	8
McMinamen	16	14	17	13	20	10
Moffatt	16	14	16	14	17	13
Cattral	17	13	21	9	20	10
Wilson	23	7	25	5	24	6
Wertenberger	18	12	23	7	13	17
Percentage of Hits	77.2		80.6		72.7	

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Prone. 200 Yards With Bipod. 20 Round Bursts

	EM-2		FN		T-25	
	Hits	Misses	Hits	Misses	Hits	Misses
Thwaites	22	38	51	9	25	35
Roberts	54	6	54	6	36	24
Martin	54	6	24	36	26	34
White	54	6	47	13	52	8
Grigg	60	0	46	14	54	6
Foxworth	58	2	49	11	41	19
Herrin	60	0	52	8	60	0
MacIntyre	44	16	38	22	12	48
Gordon	52	8	57	3	40	20
Paradis	36	24	58	2	7	53
Paille	33	27	32	28	39	21
McMinamen	34	26	40	20	44	16
Moffatt	47	13	19	41	51	9
Cattral	34	26	50	10	26	34
Wilson	39	21	33	27	27	33
Wertenberger	37	23	19	41	31	29
Percentage of Hits	74.8		69.7		59.5	

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TEST 7 - 50 Yards PRONG W/BIPOD - HOT BARREL -1st ORDER FIRED W/COOL BARREL

FIRER	ORDER 1	ORDER 2	NUMBER 3	NUMBER 4	ORDER 1	ORDER 2	NUMBER 3	NUMBER 4	ORDER 1	ORDER 2	NUMBER 3	NUMBER 4
1. FOX'TOOTH	.24	.49	.40	.40	1.02	.45	.37	.35	19	25	37	29
	.81	.77	.46	.53	.72	.63	.29	.37	26	23	26	28
2. PRESTRIDGE	.42	.49	.56	.58	.33	.27	.29	.67	27	29	25	24
	.49	.27	.54	.28	.19	.28	.26	.20	26	25	55	66
3. ROBERTS	.26	.44	.46	4.8	.31	.43	.49	.80	12	32	39	29
	.47	.57	.39	.34	.54	.40	.26	.32	25	46	36	42
4. WHITE	.46	.53	.43	.59	.89	1.02	.72	.62	45	23	33	47
	.50	.59	.79	.41	.50	.70	.31	.73	31	28	50	40
5. HERRIN	.47	.48	.49	.45	.71	.32	.25	.34	52	49	42	47
	.79	.44	.41	.44	.33	.40	.97	.49	29	37	34	20
6. THWAITES	.43	.37	.40	.34	.13	.25	.22	.70	28	30	38	29
	.59	.37	.53	.36	.14	.25	.32	.43	23	32	26	40
TOTALS	5.93	5.81	5.86	5.20	5.81	5.40	4.75	5.92	3.43	3.79	4.41	4.41
AVERAGE	.49	.48	.49	.43	.48	.45	.40	.49	.29	.32	.37	.37

Inclosure No. 2, T-7

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TEST NO. 7- C:

50 YARDS AUTOMATIC - PRONE W/BIPOD
VARIANCE OF CENTER OF IMPACT OF HOT BARREL OVER COOL BARREL

FIRER	E M - 2						F N						T		
	2nd		3rd		4th		2nd		3rd		4th		2nd		
FOXWORTH	.05L	.23D	.03L	1.00D	.18L	.67D	.42R	.50U	.36R	.57U	.39R	.53U	.18L	.13D	.26I
	.12R	.20D	.27R	.30D	.48R	1.62D	.15R	1.20D	.10L	.02D	.01R	.05D	.05L	.47D	.12I
PRESTRIDGE	.10L	.32D	.07R	.03D	.04R	.10D	.40R	1.18D	.43R	1.16D	.06R	1.09D	.10R	.50D	.06I
	.04L	.22D	.54R	.21D	.30R	.18D	.04R	.18D	.04L	.10D	.07L	.09U	.04L	.02U	.25I
ROBERTS	.09L	1.86D	.12L	.77D	.24R	.87D	.03L	.69D	.06L	.70D	.23L	.60D	.27L	.09D	.08I
	.22R	.62U	.04R	.65U	.27R	.47U	.27R	.73D	.09R	.62D	.05R	.56D	.19L	.05D	.09R
WHITE	.10L	.65U	.02R	.24D	.15R	.01U	1.09R	.24D	1.21R	.66U	1.43R	.07U	.31R	.08U	.10R
	.04R	.42D	.83R	.55D	.35R	.50D	.57R	.68U	.48R	.02U	.38R	.43U	.02L	.11U	.04I
HERRIN	.05R	.26D	.05R	.51U	.25R	.32D	.02R	.15U	.02L	.06U	.14R	.19U	.06R	.17U	.23R
	.07R	.07D	.00	.26U	.29R	.10D	.01L	1.09D	.89L	.16D	.68L	1.00D	.22L	.24D	.02I
THWAITES	.17R	.19D	.06L	.33D	.06R	.23D	.02R	1.46D	.16L	.35D	.03L	.49D	.04R	.34D	.10I
	.16R	.70U	.14L	.42U	.16L	.42U	.07L	.01D	.02L	.05D	.08R	.08D	.26R	.60D	.04I
AVERAGES	.04R	.15D	.12R	.13D	.17R	.31D	.24R	.45D	.11R	.15D	.13R	.21D	.02L	.17D	.05L
AVERAGES ALL OTHERS:	.11R .20D						.16R .27D								

Inclosure No. _____.

Inclosure No. 2,

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Test No. 7:

BAR - Bren MG - T-25 (HB). Firing 100 yards

2 & 3 Round Burst

	Mean Radius			Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	BAR	Bren	T-25 (HB)	BAR	Bren	T-25 (HB)	BAR	Bren	T-25 (HB)	BAR	Bren	T-25 (HB)
Foxworth	.31	.47	.41	.85	1.10	1.02	.56	1.20	.63	.94	1.42	1.06
Herrin	.24	.36	.57	.68	1.03	1.54	.46	.85	.64	.80	1.34	1.68
Roberts	.42	.34	.61	1.45	1.02	2.20	.92	.77	1.16	1.68	1.08	2.40
Moffatt	.56	.27	.34	1.76	.89	1.06	1.04	.52	.95	1.95	.94	1.21
Thwaites	.42	.20	.47	1.08	.76	1.43	.67	.50	.59	1.23	.80	1.61
White	.61	.38	.68	1.78	.95	1.94	1.09	.43	.70	2.14	.99	2.00
Average	.43	.34	.51	1.27	.96	1.53	.79	.71	.78	1.46	1.10	1.66
				5 Round Bursts.								
Foxworth	.55	.43	.67	1.77	1.27	2.18	.91	.91	.87	1.79	1.37	2.99
Herrin	.42	.36	.76	1.37	1.16	2.74	.94	.68	1.22	1.47	1.30	2.86
Roberts	.49	.38	.66	1.24	.92	2.07	1.09	1.09	1.12	1.48	1.31	2.26
Moffatt	1.03	.48	.72	3.13	1.17	1.81	1.62	1.32	1.22	3.23	1.78	2.19
Thwaites	.88	.35	.50	2.96	.98	1.61	1.56	.63	.92	3.34	1.15	1.75
White	.77	.70	.57	2.02	1.85	1.92	1.62	.64	.92	2.52	1.90	1.99
Average	.69	.45	.65	2.08	1.23	2.06	1.29	.88	1.05	2.31	1.47	2.34
				20 Round Bursts								
Foxworth	.57	.33	.56	2.10	1.01	2.62	1.17	1.06	1.38	2.23	1.26	2.90
Herrin	.49	.57	.52	1.72	1.82	1.43	1.78	.98	1.36	2.26	1.91	2.08
Roberts	.43	.41	.74	1.54	1.34	2.35	1.14	1.12	1.38	1.66	1.67	2.36
Moffatt	.61	.42	.98	1.36	.96	2.59	1.79	1.29	1.64	1.85	1.47	2.87
Thwaites	.39	.40	.56	1.61	1.19	1.43	.79	1.22	2.06	1.68	1.56	2.46
White	.63	.50	.75	1.40	1.71	2.04	2.03	.84	1.99	2.16	1.79	2.40
Average	.52	.44	.69	1.62	1.34	2.08	1.45	1.09	1.64	1.97	1.61	2.51

Inclosure No. 3, T-7

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BAR - Bren MG - T-25 (HB). Firing 200 Yards

2 & 3 Round Bursts

	Mean Radius			Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	BAR	Bren	T-25(HB)	BAR	Bren	T-25(HB)	BAR	Bren	T-25(HB)	BAR	Bren	T-25H
Foxworth	.95	.73	.85	1.95	2.08	2.81	2.01	1.34	1.20	2.74	2.18	2.8
Herrin	.80	.80	1.04	2.44	2.06	2.87	1.12	1.37	1.07	2.61	2.36	2.61
Roberts	.54	.62	.65	1.16	1.56	1.66	1.62	1.39	1.51	1.88	1.78	2.01
Moffatt	.62	.73	.75	1.99	1.74	2.57	1.26	2.18	1.55	2.17	2.64	2.94
Thwaites	.50	.42	.63	1.01	1.35	1.54	2.30	.83	1.62	2.44	1.41	2.01
Coulas	1.10	.75	.77	2.86	2.44	2.53	2.09	1.48	1.43	3.20	2.75	3.10
Average	.75	.68	.78	1.90	1.87	2.33	1.73	1.43	1.40	2.51	2.19	2.58

5 Round Bursts

	Mean Radius			Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	BAR	Bren	T-25(HB)	BAR	BREN	T-25(HB)	BAR	Bren	T-25(HB)	BAR	Bren	T-25H
Foxworth	.77	1.12	.86	1.53	2.80	2.64	2.29	1.38	1.22	2.48	3.02	2.92
Herrin	1.03	.92	1.04	2.58	2.80	2.67	2.21	1.35	2.32	3.04	3.35	3.72
Roberts	.70	.77	1.15	2.03	1.72	3.69	1.88	1.99	2.09	2.46	2.19	3.59
Moffatt	.95	1.51	1.88	1.80	2.86	4.21	1.52	2.06	2.42	2.09	3.25	4.60
Thwaites	.80	.75	.78	2.01	2.38	1.77	1.81	1.14	2.09	2.34	2.44	2.53
Coulas	1.23	.88	.96	2.57	2.61	2.30	2.67	1.47	2.34	3.20	2.73	2.87
Average	.91	.99	1.11	2.09	2.53	2.88	2.06	1.57	2.08	2.60	2.83	3.37

Inclosure No. 3, T-7

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Test No. 8:

1. Purpose: To determine the comparative automatic fire accuracy of the test rifles unsupported by artificial rests.

2. Method:

a. Sixteen riflemen previously trained in automatic firing of the rifles fired in this test.

b. Weapons were fired in three positions, prone, kneeling and standing.

c. The loop sling was used in this firing.

d. Ranges fired were 15, 25 and 50 yards.

e. Rates of fire used were two and three round, five round and twenty round bursts.

f. Each rifleman fired each model rifle twice. Rifles were rotated among test personnel.

g. In each firing three 10 round groups were fired except for the twenty round burst when three groups of twenty round bursts were fired.

h. The mean radius (MR), maximum horizontal (MH) and vertical (MV) dispersion and maximum spread (MS) were measured.

3. Results:

a. Averages (in feet) of all Shot Groups.

2 and 3 Round Burst

25 Yards

	MR			MH			MV			MS		
Position	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Prone	.74	.48	.86	1.47	.91	2.20	1.54	1.01	1.07	2.06	1.36	2.39
Kneeling	1.65	1.38	1.51	3.40	2.61	3.32	2.25	2.25	1.65	4.03	3.40	3.70
Standing	1.39	1.22	1.21	2.46	2.01	2.88	2.67	2.50	1.28	3.64	3.12	2.90

Figure No. 1

50 Yards

	MR			MH			MV			MS		
Prone	1.25	.85	1.71	2.52	1.70	3.85	1.92	1.93	1.77	3.12	2.35	4.10

Figure No. 2

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5 Round Burst

15 Yards

	MR			MH			MV			MS		
Position	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Prone	.43	.47	.60	1.06	1.19	1.80	.87	.92	.90	1.29	1.33	1.99
Kneeling	1.08	1.04	1.41	2.75	2.66	3.94	2.01	2.13	1.91	3.18	3.15	4.12
Standing	.91	1.02	1.16	1.99	2.28	2.73	2.09	2.56	1.98	2.69	3.14	3.16

Figure No. 3

50 Yards

	MR			MH			MV			MS		
Position	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Prone	1.46	1.50	1.95	3.56	3.48	4.68	2.19	2.52	2.51	4.02	3.96	5.07

Figure No. 4

20 Round Burst

15 Yards

	MR			MH			MV			MS		
Position	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Prone	.26	.42	.40	1.10	1.45	1.64	.64	.91	.95	1.20	1.65	1.83
Kneeling	.83	.79	1.03	3.02	2.94	3.36	1.92	2.22	2.29	3.31	3.37	3.74
Standing	.85	.94	1.08	2.68	2.88	2.78	2.13	2.51	2.62	3.16	3.47	3.40

Figure No. 5

50 Yards

	MR			MH			MV			MS		
Position	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
Prone	.92	1.53	1.85	2.64	3.39	4.04	2.12	2.93	2.57	3.12	4.07	4.43

Figure No. 6

b. Detailed results are in Inclosure 1 .

c. Typical shots, groups actually fired, were selected and plotted in order that pattern trends could be studied. (See Figures 7 , 8 and 9)

d. At 50 yards, standing and kneeling, dispersion was so great that only a portion of hits could be recorded.

4. Analysis:

a. Comparative accuracy from different firing positions:

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(1) Prone (smallest MR)

(2) Standing

(3) Kneeling (largest MR)
(See Figure No. 10)

b. Comparative accuracy of bursts of various lengths:

(1) 2 - 3 rounds (smallest MR).

(2) 20 rounds

(3) 5 rounds (largest MR)
(See Figure No. 10)

c. Comparative accuracy of test rifles: The EM-2 and FN are equal, and both are superior to the T-25.

Note: The above comparisons a, b, and c are based on average mean radii. The three factors MH, MV, and MS may be considered as functions of MR.

d. Comparisons of test results with required standards:

None of the test rifles met the requirement that all shots from a five round burst shall strike within a 24 inch circle when hand held in the standing position at a range of 50 yards. (See Military Characteristics of a Lightweight Rifle, Project No. 2227).

The automatic fire accuracy of the test rifle when fired under the condition of this test is acceptable at ranges up to 25 yards. (Appendix F-11, F-12, F-13)

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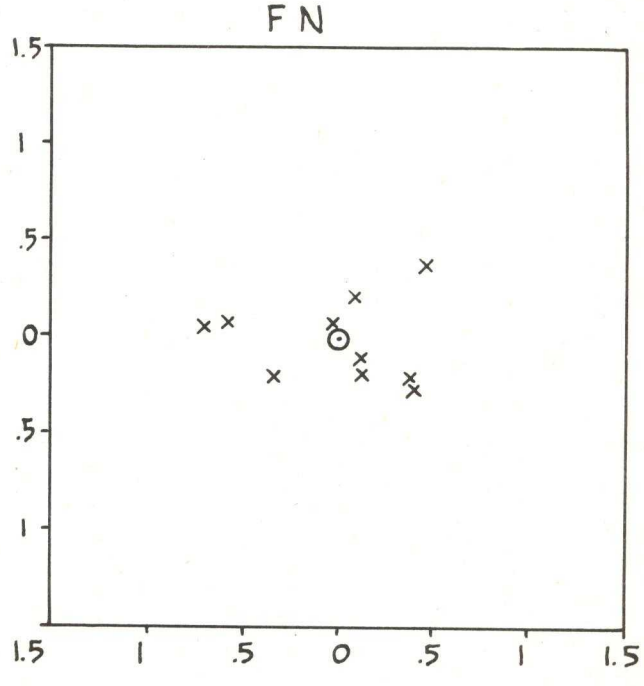
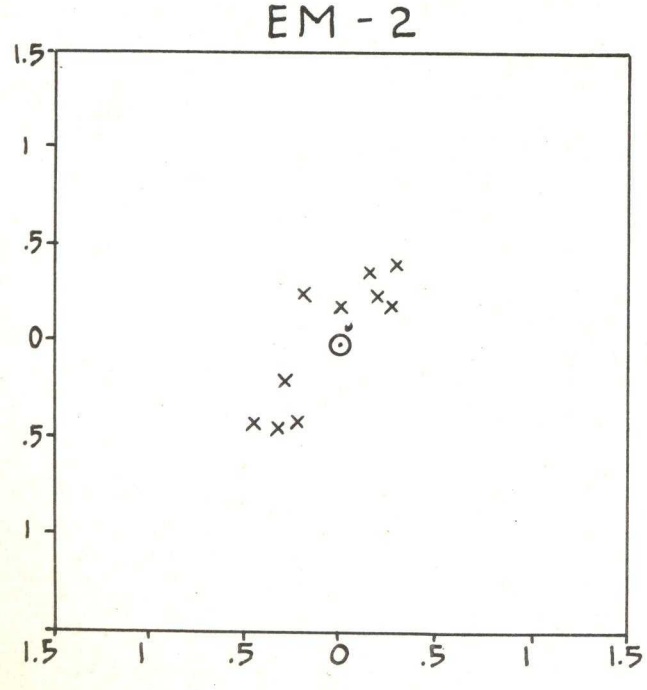
TEST 8
TYPICAL SHOT GROUP
PRONE - TWO 5 ROUND BURSTS - 15 YARDS

EM-2, FN, AND T-25 RIFLES

DISPERSION IN FEET

⊙ = CENTER OF IMPACT





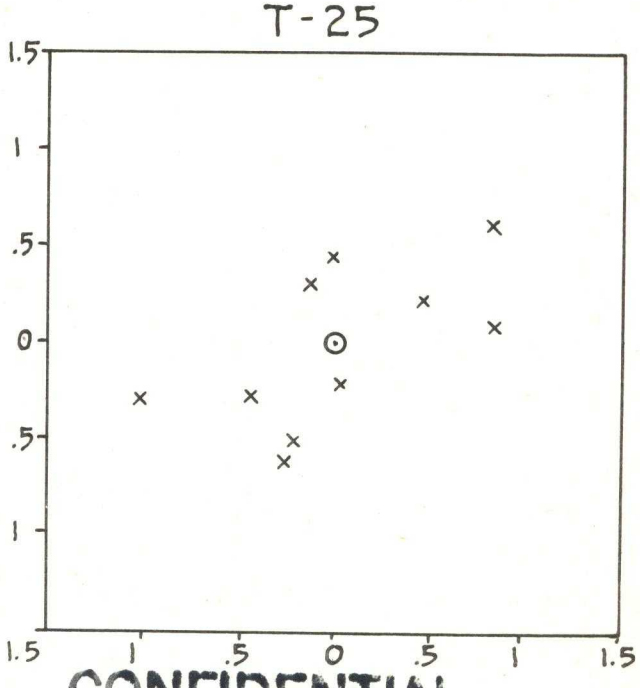


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FIG. 7

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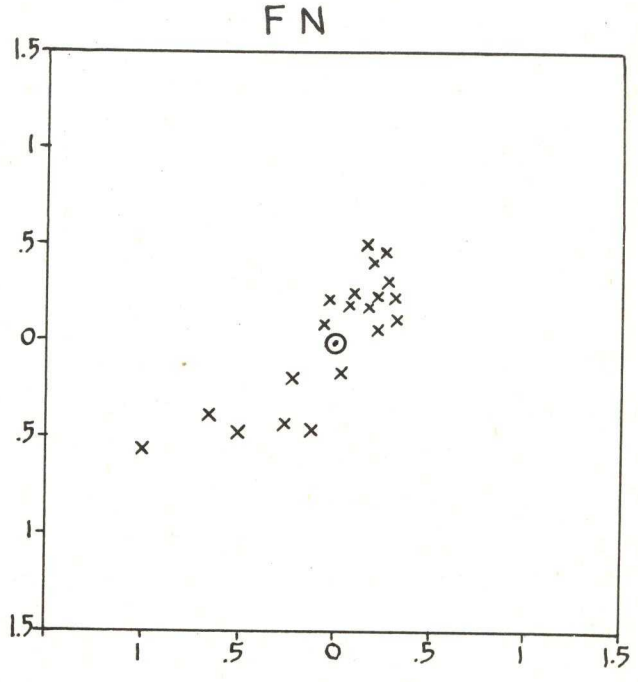
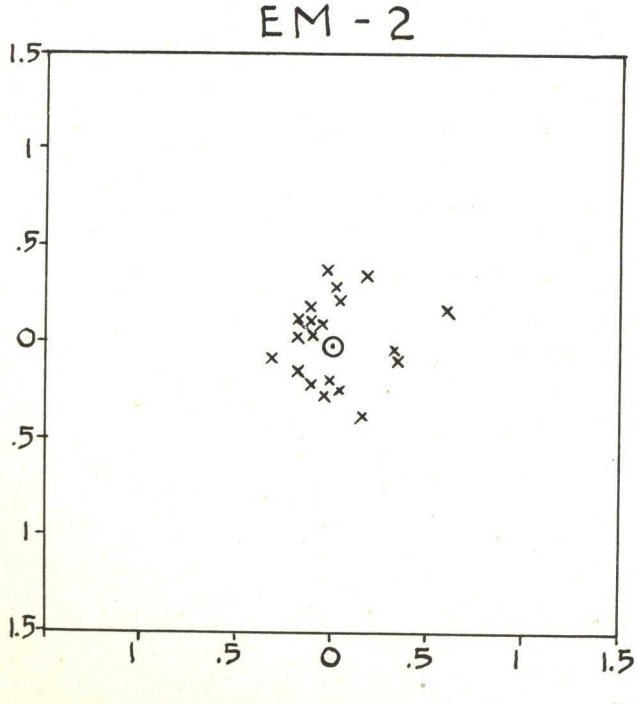
TEST 8
TYPICAL SHOT GROUP
PRONE - 20 ROUND BURST - 15 YARDS

EM-2, FN, AND T-25 RIFLES

DISPERSION IN FEET

⊙=CENTER OF IMPACT





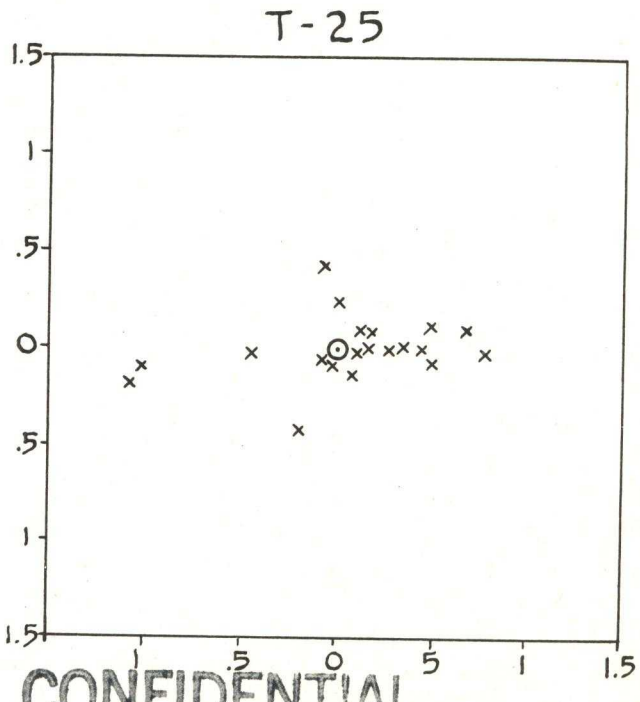


FIG. 8

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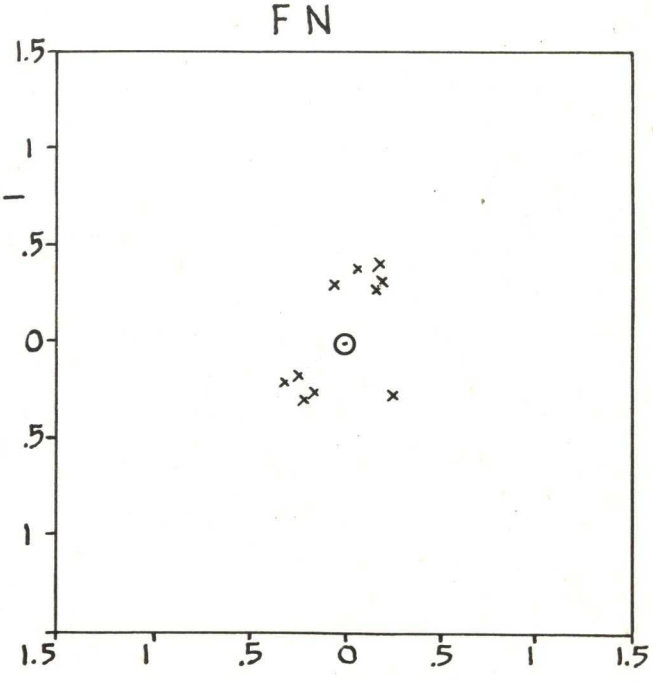
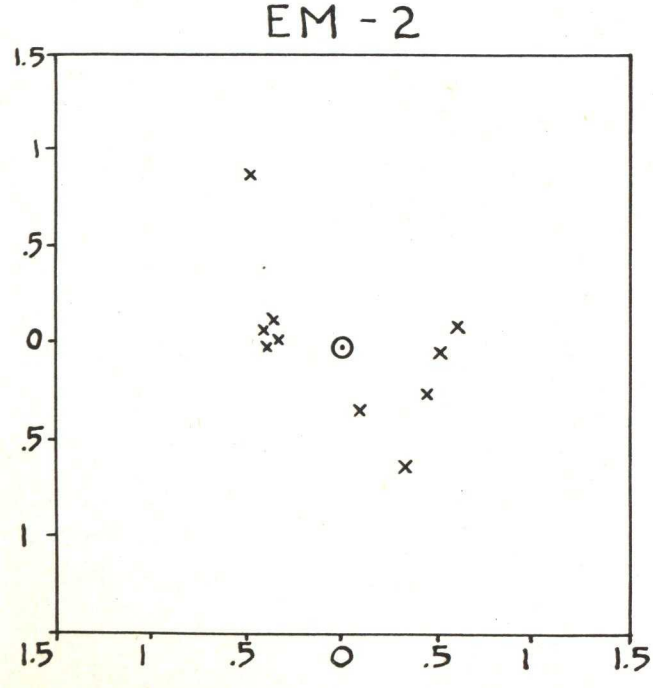
TEST 8
TYPICAL SHOT GROUP
PRONE - 2 & 3 ROUND BURSTS -
25 YARDS
EM-2, FN, AND T-25 RIFLES
TOTAL ROUNDS: 10
DISPERSION IN FEET
⊙ = CENTER OF IMPACT





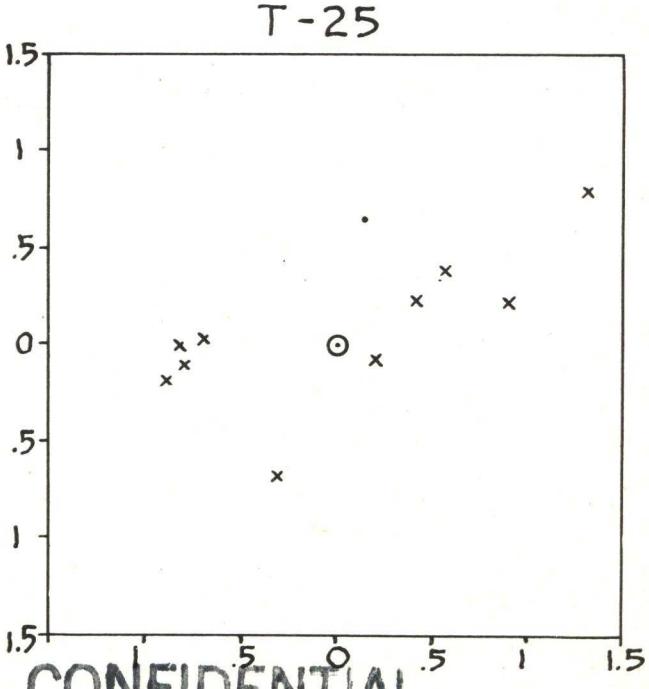


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FIG. 9

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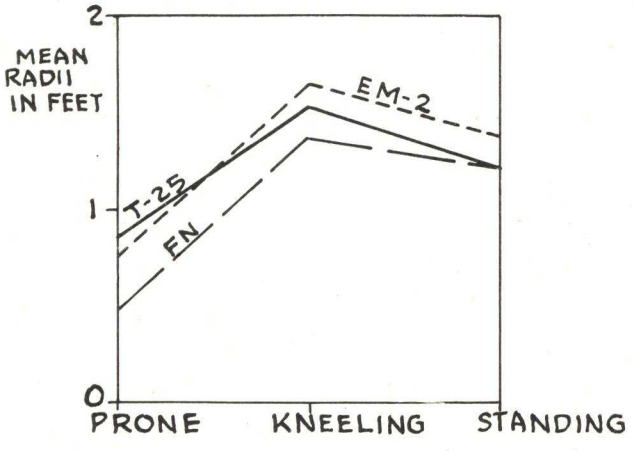
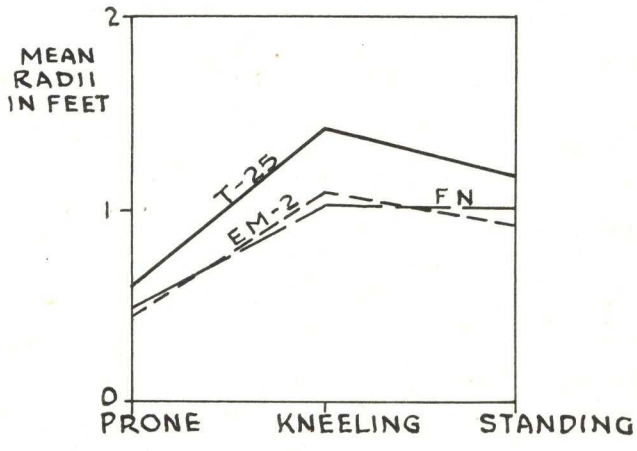
TEST 8
ACCURACY IN AUTOMATIC FIRE
EM-2, FN, AND T-25 RIFLES

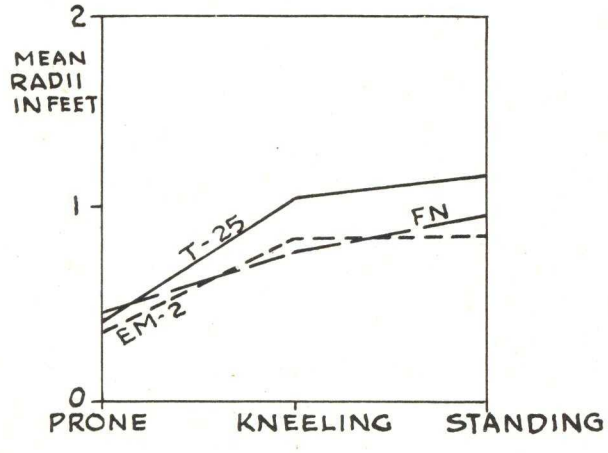
2 & 3 ROUND BURSTS
25 YARDS



5 ROUND BURSTS
15 YARDS



20 ROUND BURST
15 YARDS



LENGTH OF BURST vs ACCURACY
PRONE - 50 YARDS

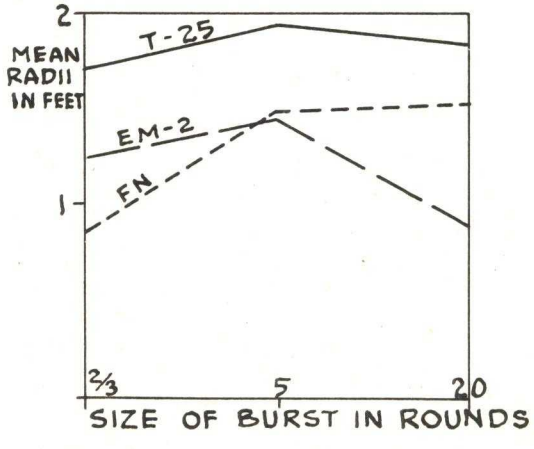


FIG. 10

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Prone. 2 & 3 Round Burst. 25 yards.

Each figure shows average mean radius of 3 shot groups (10 Rounds each)

	EM-2	FN	T-25
1. Thwaites	.50	.67	1.02
2. Roberts	.45	.25	.75
3. Martin	.37	.37	.79
4. White	1.23	.52	1.21
5. Grigg	1.00	.62	.97
6. Foxworth	.78	.42	.89
7. Herrin	.69	.19	.63
8. MacIntyre	.98	.46	.88
Average (Experts)	.75	.44	.89
9. Gordon	.64	.43	.67
10. Paradis	.64	.39	.86
11. Paille	.82	.50	1.02
12. McMinamen	.65	.73	.98
13. Moffatt	.59	.43	.71
14. Cattral	.78	.26	.81
15. Wilson	.78	.60	.87
16. Wertenberger	.97	.76	.66
Average (other firers)	.73	.51	.82
Average (all firers)	.74	.48	.86

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	.67	1.51	2.52	1.24	1.46	1.19	1.33	1.87	2.75
2. Roberts	1.05	.65	2.11	1.00	.51	.89	1.26	.77	2.31
3. Martin	1.02	.62	2.07	1.56	.81	.83	1.64	.96	2.20
4. White	2.44	.91	2.57	1.97	1.35	1.64	2.85	1.81	2.99
5. Grigg	1.64	.82	2.04	1.68	1.41	1.51	2.25	1.68	2.38
6. Foxworth	.94	.40	1.91	1.99	1.00	1.01	2.25	1.19	2.03
7. Herrin	1.07	.41	1.67	1.46	.54	.84	1.71	.63	2.50
8. MacIntyre	2.22	1.08	2.11	1.09	.61	.86	2.35	1.29	2.27
9. Gordon	1.47	1.12	2.54	1.68	.48	1.08	1.58	1.14	2.64
10. Paradis	.92	.86	2.08	1.34	.58	.70	1.54	.99	1.79
11. Paille	1.83	1.31	2.70	1.80	.84	1.25	2.37	1.45	2.73
12. McMinamen	1.10	1.21	2.88	1.27	1.58	1.11	1.63	1.91	3.05
13. Moffatt	.91	1.27	1.69	1.71	.88	.79	1.82	1.48	1.81
14. Wilson	1.77	1.17	2.60	1.46	1.31	.60	2.47	1.59	2.65
15. Cattral	2.88	.74	2.04	1.06	.73	1.18	3.42	1.02	2.22
16. Wertenberger	1.57	.49	1.60	2.27	2.00	1.69	2.46	2.04	1.97
Average	1.47	.91	2.20	1.54	1.01	1.07	1.71	.63	2.50

Figure No. 11

Inclosure No. 1, T-8

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Kneeling. 2 & 3 Round Burst. 25 yards

Each figure shows average mean radius of 3 shot groups (10 Rounds each)

	EM-2	FN	T-25
1. Thwaites	1.06	1.25	1.51
2. Roberts	1.59	1.11	1.20
3. Martin	2.02	1.90	2.02
4. White	2.32	1.97	1.49
5. Grigg	1.79	1.65	1.50
6. Foxworth	1.72	1.22	1.43
7. Herrin	1.12	.90	1.13
8. MacIntyre	1.34	1.18	1.03
Average (Experts)	1.62	1.40	1.41
9. Gordon	1.83	1.52	1.28
10. Paradis	2.04	1.55	2.00
11. Paille	1.89	1.85	1.44
12. McMinamen	1.83	1.43	1.92
13. Moffatt	.85	.74	1.25
14. Cattral	2.05	1.28	1.63
15. Wilson	1.40	1.22	1.36
16. Wertenberger	1.56	1.32	1.96
Average (other firers)	1.68	1.36	1.61
Average (all firers)	1.65	1.38	1.51

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	2.31	2.42	3.82	1.91	2.39	.99	3.01	3.27	3.96
2. Roberts	4.06	2.00	2.60	2.06	1.73	1.16	4.49	2.60	2.75
3. Martin	4.21	3.08	3.05	1.91	2.76	1.03	4.71	4.12	4.11
4. White	5.38	3.49	3.97	2.78	3.71	.54	5.83	4.33	3.97
5. Grigg	2.63	2.23	2.86	3.21	2.89	1.99	3.95	3.60	3.41
6. Foxworth	2.93	2.57	2.78	2.71	2.06	1.74	3.89	3.29	3.12
7. Herrin	2.67	1.83	3.39	2.14	1.57	1.81	3.20	2.59	3.97
8. MacIntyre	2.18	2.01	2.10	2.06	1.85	1.48	2.97	2.61	2.40
9. Gordon	3.38	3.01	2.59	2.67	2.41	2.46	4.14	3.78	3.55
10. Paradis	3.72	3.09	3.92	2.61	1.77	1.68	4.48	3.56	4.27
11. Paille	5.55	3.86	3.91	1.43	2.72	1.50	5.89	4.72	4.12
12. McMinamen	3.94	2.62	4.27	2.72	2.73	1.84	4.60	3.48	4.49
13. Moffatt	2.45	1.61	3.73	1.59	1.48	1.69	2.73	2.20	3.76
14. Wilson	3.12	2.85	2.86	1.53	2.72	1.84	3.38	3.75	3.42
15. Cattral	2.82	2.60	3.34	2.54	1.63	2.64	3.71	2.93	4.48
16. Wertenberger	3.10	2.50	3.94	2.14	1.57	1.81	3.57	3.56	4.09
Average	3.40	2.61	3.32	2.25	2.25	1.65	4.03	3.40	3.74

Figure No. 12

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Standing: 2 & 3 Round Burst. 25 yards.

Each figure shows average mean radius of 3 shot groups (10 Rounds each)

	EM-2	FN	T-25
1. Thwaites	.54	.70	1.18
2. Roberts	1.68	1.52	1.10
3. Martin	1.63	1.48	1.37
4. White	1.39	1.18	1.27
5. Grigg	1.66	1.20	1.15
6. Foxworth	1.43	1.26	1.06
7. Herrin	1.55	1.12	.97
8. MacIntyre	1.48	1.16	1.13
Average (Experts)	1.42	1.20	1.15
9. Gordon	1.28	1.03	2.09
10. Paradis	1.54	1.85	.95
11. Paille	1.82	1.37	.72
12. McMinamen	1.05	1.15	1.37
13. Moffatt	.90	.90	.85
14. Cattral	1.93	1.38	1.14
15. Wilson	1.44	1.04	1.55
16. Wertenberger	.93	1.10	1.53
Average (other firers)	1.36	1.23	1.28
Average (all firers)	1.39	1.22	1.21

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	1.35	2.40	3.95	1.29	1.23	1.45	3.63	3.73	1.60
2. Roberts	2.60	1.97	2.40	3.06	2.92	.54	3.83	3.48	2.42
3. Martin	2.42	2.58	2.82	2.75	2.53	1.13	3.88	3.55	2.84
4. White	2.96	2.48	2.90	2.13	1.95	.67	3.35	3.19	2.96
5. Grigg	2.80	1.63	2.52	3.66	2.89	.73	4.52	3.25	2.53
6. Foxworth	2.29	1.68	2.35	2.94	2.59	1.61	3.38	3.03	2.65
7. Herrin	1.57	1.31	2.66	3.50	2.71	1.07	3.78	3.06	2.74
8. MacIntyre	2.14	1.62	2.24	3.30	2.21	1.55	3.73	2.58	2.69
9. Gordon	1.95	1.67	4.14	2.89	2.83	2.65	3.36	2.55	4.38
10. Paradis	2.48	2.75	2.46	2.92	3.75	1.22	3.79	4.53	2.59
11. Paille	4.08	2.29	2.13	3.09	2.52	1.27	4.61	3.33	2.31
12. McMinamen	1.98	1.81	2.50	1.29	2.45	1.55	3.03	2.88	2.70
13. Moffatt	2.20	1.60	2.18	1.54	2.43	1.49	2.47	2.82	2.45
14. Cattral	3.08	2.37	3.45	3.25	2.36	1.00	4.37	3.18	3.51
15. Wilson	2.86	1.65	4.62	2.88	2.32	1.63	3.71	2.66	4.83
16. Wertenberger	2.52	2.42	3.13	2.15	2.35	.84	2.87	3.13	3.16
Average	2.46	2.01	2.88	2.67	2.50	1.28	3.64	3.12	2.90

Figure No. 13

Inclosure No. 1, T-8

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Prone. 2 & 3 Round Burst. 50 yards.

Each figure shows average mean radius of 3 shot groups (10 Rounds each)

	EM-2	FN	T-25
1. Thwaites	1.04	.53	2.38
2. Roberts	.68	.59	1.50
3. Martin	.95	.49	1.50
4. White	1.87	1.76	2.21
5. Grigg	1.50	.63	2.29
6. Foxworth	1.78	.91	1.66
7. Herrin	.97	.73	1.22
8. MacIntyre	.63	.38	.97
Average (Experts)	1.18	.75	1.72
9. Gordon	.83	.91	1.34
10. Paradis	1.13	.74	1.63
11. Paille	1.31	.55	1.56
12. McMinamen	1.60	1.67	2.31
13. Moffatt	1.68	.66	1.33
14. Cattral	1.27	1.06	2.17
15. Wilson	1.26	.84	1.50
16. Wertenberger	1.53	1.20	1.83
Average (other firers)	1.33	.95	1.71
Average (all firers)	1.25	.85	1.71

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	2.16	1.50	4.43	1.84	1.20	2.86	2.88	1.68	4.96
2. Roberts	1.00	1.02	3.71	1.55	1.42	.90	1.59	1.68	3.78
3. Martin	2.16	1.01	3.41	2.33	.96	2.07	3.17	1.36	3.58
4. White	4.13	1.60	4.72	1.99	3.81	1.80	4.31	2.66	4.77
5. Grigg	3.35	1.31	4.64	1.77	1.40	1.09	3.60	1.76	4.69
6. Foxworth	2.19	.89	3.07	3.17	2.67	1.77	3.50	2.76	3.50
7. Herrin	2.11	1.54	3.66	2.06	1.69	1.42	2.74	1.88	3.67
8. MacIntyre	1.15	.80	2.49	1.38	1.04	1.44	1.40	1.13	2.68
9. Gordon	2.19	2.62	4.28	1.35	2.34	1.39	2.52	3.21	4.34
10. Paradis	2.86	2.05	4.44	.98	1.16	.99	3.09	2.41	4.49
11. Paille	3.72	1.89	2.35	2.77	1.04	1.21	4.78	1.95	2.53
12. McMinamen	2.70	2.83	4.98	1.73	3.42	2.51	3.01	4.11	5.20
13. Moffatt	2.86	1.74	3.55	2.97	1.88	1.62	3.96	2.01	3.70
14. Wilson	4.64	2.78	3.73	1.86	1.69	3.85	4.96	2.95	4.98
15. Cattral	.45	1.44	3.99	1.11	2.41	2.43	1.13	2.52	4.44
16. Wertenberger	2.72	2.16	4.21	1.89	2.82	.90	3.22	3.51	4.26
Average	2.52	1.70	3.85	1.92	1.93	1.77	3.12	2.35	4.10

Figure No. 14

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Prone. Five (5) Round Burst. 15 yards.

Each figure shows average mean radius of three (3) groups (10 rounds each)

	EM-2	FN	T-25
1. Thwaites	.22	.75	.90
2. Roberts	.21	.25	.55
3. Martin	.33	.25	.62
4. White	.30	.34	.62
5. Grigg	.40	.28	.52
6. Foxworth	.60	.37	.56
7. Herrin	.38	.33	.45
8. MacIntyre	.40	.99	.40
Average (Experts)	.36	.45	.58
9. Gordon	.46	.50	.45
10. Paradis	.32	.32	.46
11. Paille	.59	.66	.81
12. McMinamen	.78	.53	.89
13. Moffatt	.49	.39	.49
14. Cattral	.33	.34	.77
15. Wilson	.70	.78	.47
16. Wertenberger	.32	.46	.69
Average (all others)	.50	.50	.63
Average (all firers)	.43	.47	.60

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	.52	2.35	2.60	.55	1.10	1.88	.69	2.55	3.14
2. Roberts	.67	.66	1.86	.39	.64	.55	.72	.77	1.88
3. Martin	.72	.46	1.68	.58	.55	1.25	.90	.74	1.92
4. White	.99	.60	2.36	.51	.92	.78	1.00	1.00	2.83
5. Grigg	1.08	.71	1.77	.89	.65	.58	1.23	.76	1.80
6. Foxworth	1.48	1.13	1.85	.69	.60	.68	1.56	1.20	1.92
7. Herrin	.94	1.08	1.48	.80	.54	.57	1.16	1.15	1.56
8. MacIntyre	.78	1.58	1.16	1.51	2.01	.86	.95	1.02	1.32
9. Gordon	1.22	1.53	1.38	1.17	.86	.69	1.54	1.70	1.43
10. Paradis	1.04	.91	1.12	.56	.65	1.04	1.13	.93	1.32
11. Paille	1.41	1.03	1.94	1.36	1.70	1.24	1.90	1.91	2.31
12. McMinamen	1.00	.95	2.57	1.96	.92	1.45	2.02	1.02	2.65
13. Moffatt	1.74	1.06	1.33	.71	.64	.88	1.86	1.11	1.49
14. Wilson	.87	1.00	2.15	.56	.81	1.10	1.06	1.22	2.24
15. Cattral	1.57	2.54	1.28	.97	1.14	.92	1.75	2.78	1.69
16. Wertenberger	.93	1.37	2.27	.68	.97	1.15	1.14	1.49	2.39
Average	1.06	1.19	1.80	.87	.92	.98	1.39	1.33	1.89

Figure No. 15

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Kneeling. Five (5) Round Burst. 15 yards.

Each figure shows average mean radius of three (3) shot groups (10 Rds each)

	EM-2	FN	T-25
1. Thwaites	1.08	1.04	1.37
2. Roberts	.77	.71	1.44
3. Martin	1.11	1.49	1.71
4. White	1.22	1.11	1.67
5. Grigg	1.01	.91	.91
6. Foxworth	.91	.93	1.39
7. Herrin	.81	.86	1.60
8. MacIntyre	1.87	.78	.81
Average (Experts)	1.10	.98	1.36
9. Gordon	.92	1.43	1.49
10. Paradis	.95	.85	1.30
11. Paille	1.15	1.24	1.88
12. McMinamen	1.35	1.47	1.37
13. Moffatt	1.15	.80	1.39
14. Cattral	1.12	1.14	1.52
15. Wilson	.73	.85	1.32
16. Wertenberger	1.09	1.10	1.37
Average (Other Firers)	1.06	1.11	1.46
Average (all firers)	1.08	1.04	1.41

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	3.22	2.98	4.32	1.56	1.83	1.84	3.24	2.89	2.88
2. Roberts	2.21	2.52	5.42	1.46	1.35	1.62	3.19	4.36	3.35
3. Martin	3.29	3.38	4.83	1.56	2.47	1.37	2.50	2.53	4.05
4. White	3.65	3.41	3.94	1.98	1.67	2.81	2.54	2.64	5.68
5. Grigg	2.46	1.91	2.48	2.50	2.50	1.67	3.31	2.51	4.91
6. Foxworth	2.95	2.62	4.32	1.79	2.07	1.42	2.90	3.28	5.43
7. Herrin	1.43	2.52	4.40	2.14	2.29	2.05	4.80	2.65	4.40
8. MacIntyre	2.88	1.65	1.54	2.90	1.97	1.48	3.59	2.52	3.18
9. Gordon	2.95	2.65	2.89	1.22	3.63	2.07	3.34	3.32	4.49
10. Paradis	2.29	2.34	3.90	2.01	1.63	1.62	2.84	3.06	4.29
11. Paille	2.72	2.44	5.27	2.34	2.73	2.18	2.04	2.48	4.35
12. McMinamen	4.15	3.15	4.33	2.58	3.02	1.57	3.45	4.09	4.90
13. Moffatt	2.98	2.44	3.32	2.47	1.38	2.32	3.73	2.49	1.96
14. Wilson	1.66	2.39	4.25	1.49	1.61	1.84	3.87	3.46	4.18
15. Cattral	2.54	2.91	4.14	1.96	2.04	1.95	3.03	3.76	4.00
16. Werterberger	2.66	3.19	3.67	2.26	1.94	2.82	2.48	3.33	4.73
Average	2.75	2.66	3.94	2.01	2.13	1.91	3.18	3.15	4.21

Figure No. 16

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Standing. Five (5) Round Burst. 15 yards.

Each figure shows average mean radius of three (3) shot groups (10 rds ea.

	EM-2	FN	T-25
1. Thwaites	.76	.98	1.33
2. Roberts	.63	.80	.82
3. Martin	1.07	1.18	1.55
4. White	.78	1.13	1.56
5. Grigg	.87	1.07	.54
6. Foxworth	.67	.97	1.11
7. Herrin	.67	.85	.89
8. MacIntyre	.81	1.05	.94
Average (Experts)	.78	1.00	1.09
9. Gordon	1.11	1.20	1.17
10. Paradis	1.33	.90	.97
11. Paille	1.04	1.03	1.57
12. McMinamen	.99	.98	1.69
13. Moffatt	.96	.92	1.11
14. Cattral	1.26	.95	1.03
15. Wilson	.57	1.11	1.01
16. Wertenberger	1.02	1.16	1.31
Average (Other Firers)	1.04	1.03	1.23
Average (All Firers)	.91	1.02	1.16

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	1.68	2.16	2.88	2.35	2.27	2.43	2.44	2.61	3.17
2. Roberts	1.33	2.12	1.89	1.70	1.18	1.91	2.04	2.15	2.44
3. Martin	2.88	2.86	2.87	2.04	2.92	2.17	2.64	3.38	3.44
4. White	1.58	2.86	4.43	2.31	2.90	2.16	2.60	3.83	4.54
5. Grigg	2.87	2.68	1.32	1.79	1.99	1.27	3.15	3.04	1.51
6. Foxworth	1.71	2.28	2.78	1.14	2.28	2.35	1.92	2.72	3.37
7. Herrin	1.49	1.79	2.48	1.89	2.12	2.12	2.18	2.40	3.02
8. MacIntyre	1.41	1.84	1.96	2.61	3.32	2.20	2.83	3.57	2.75
9. Gordon	1.83	2.44	3.20	3.20	3.36	3.03	3.24	3.44	3.71
10. Paradis	3.00	1.73	2.17	2.91	2.47	1.58	4.43	2.60	2.43
11. Paille	1.92	2.14	2.20	2.24	2.74	1.50	2.69	3.20	2.78
12. McMinamen	2.32	2.63	3.01	1.95	2.71	1.85	2.85	3.69	3.21
13. Moffatt	2.11	2.39	3.00	2.03	1.77	2.09	2.76	3.01	3.48
14. Wilson	2.79	1.29	2.66	2.30	2.66	1.35	3.30	2.80	3.08
15. Cattral	1.34	2.64	3.00	1.41	3.38	2.10	1.74	3.99	3.19
16. Wertenberger	2.16	2.61	3.32	1.65	2.85	1.51	2.20	3.35	3.51
Average	1.99	2.28	2.73	2.09	2.56	1.98	2.69	3.14	3.16

Figure No. 17

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Prone. 5 Round Burst. 50 yards.

Each figure shows average mean radius of 3 shot groups (10 Rounds each)

	EM-2	FN	T-25
1. Thwaites	1.17	1.28	2.85
2. Roberts	.99	.83	1.55
3. Martin	.92	.89	1.61
4. White	1.22	1.89	2.57
5. Grigg	2.09	1.42	2.40
6. Foxworth	1.70	1.51	1.38
7. Herrin	1.45	1.53	1.30
8. MacIntyre	.87	1.30	1.13
Average (Experts)	1.30	1.33	1.85
9. Gordon	1.17	1.61	2.30
10. Paradis	1.91	1.52	2.26
11. Paille	2.07	1.53	1.94
12. McMinamen	1.86	2.26	2.14
13. Moffatt	1.49	.97	1.50
14. Cattral	2.00	1.86	2.08
15. Wilson	1.31	1.61	2.63
16. Wertenberger	1.19	2.01	1.51
Average (all others)	1.63	1.67	2.05
Average (all firers)	1.46	1.50	1.95

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	2.01	2.56	4.68	2.10	3.28	2.56	3.26	2.50	5.26
2. Roberts	2.25	2.02	4.19	1.77	2.10	2.61	2.50	2.80	4.45
3. Martin	2.30	3.10	4.40	2.24	1.45	2.12	2.98	3.28	4.69
4. White	4.06	2.54	4.65	2.08	4.24	3.95	4.40	4.34	5.91
5. Grigg	4.25	2.93	6.05	2.37	3.26	2.61	5.00	3.67	6.27
6. Foxworth	2.85	2.59	3.87	3.32	2.52	2.27	3.68	3.13	4.10
7. Herrin	3.30	4.44	4.45	2.46	1.35	1.84	4.26	4.75	4.48
8. MacIntyre	1.80	2.57	2.82	1.28	2.26	1.70	2.09	3.84	3.37
9. Gordon	2.88	4.90	5.42	1.93	1.81	2.10	3.15	4.94	5.51
10. Paradis	5.03	3.73	4.41	2.15	3.15	2.53	5.23	4.02	4.60
11. Paille	3.89	4.76	4.49	2.79	2.59	3.55	4.58	5.21	5.56
12. McMinamen	4.35	5.37	4.63	1.73	2.57	3.17	4.45	5.37	4.83
13. Moffatt	4.47	2.98	4.36	2.38	1.56	2.37	4.93	3.20	4.64
14. Cattral	6.03	4.01	6.37	2.92	3.60	3.50	6.47	4.70	6.87
15. Wilson	2.87	3.47	6.19	1.87	2.71	1.71	3.13	3.87	6.26
16. Wertenberger	4.07	3.72	3.95	1.65	1.93	1.60	4.28	3.78	4.37
Average	3.56	3.48	4.68	2.19	2.52	2.51	4.02	3.96	5.07

Figure No. 18

Inclosure No. 1, T-8

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Prone. 20 Round Burst. 15 yards.

Each figure shows average mean radius of three (3) shot groups (10 Rds each)

	EM-2	FN	T-25
1. Thwaites	.15	.37	.48
2. Roberts	.36	.37	.41
3. Martin	.24	.30	.16
4. White	.29	.42	.44
5. Grigg	.29	.41	.47
6. Foxworth	.28	.36	.51
7. Herrin	.16	.35	.16
8. MacIntyre	.14	.24	.22
Average (Experts)	.24	.35	.36
9. Gordon	.19	.35	.46
10. Paradis	.22	.36	.49
11. Paille	.50	.75	.49
12. McMinamen	.37	.81	.53
13. Moffatt	.16	.27	.43
14. Cattral	.20	.28	.38
15. Wilson	.31	.52	.31
16. Wertenberger	.26	.60	.45
Average (other firers)	.28	.49	.44
Average (all firers)	.26	.42	.40

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	.53	1.05	1.86	.68	.96	1.19	.70	1.19	2.13
2. Roberts	1.03	1.05	1.45	.98	.79	1.45	1.28	1.28	1.72
3. Martin	.77	1.17	.65	.69	.95	.65	.92	1.36	.76
4. White	1.50	1.12	2.34	.72	1.56	2.34	1.68	1.70	2.48
5. Grigg	1.12	1.60	1.90	.56	.57	1.90	1.15	1.66	2.13
6. Foxworth	1.53	1.29	1.96	.77	.47	1.96	1.61	1.38	2.00
7. Herrin	.86	1.35	2.16	.40	.69	2.16	.98	1.37	2.27
8. MacIntyre	.49	.90	1.02	.38	.74	1.02	.56	.98	1.09
9. Gordon	.97	1.40	1.74	.50	.96	1.74	1.01	1.88	1.87
10. Paradis	.66	1.79	1.75	.62	.72	1.75	.95	2.02	1.96
11. Paille	1.58	2.68	2.03	1.21	2.02	2.03	1.22	3.18	2.57
12. McMinamen	1.93	1.83	1.61	.56	.72	1.61	2.02	1.78	1.79
13. Moffatt	1.25	.89	1.28	.64	.74	1.28	1.42	1.03	1.56
14. Cattral	.78	.95	1.49	.46	.52	1.49	.86	1.04	1.53
15. Wilson	1.61	1.49	1.49	.67	.93	1.49	1.78	1.65	1.52
16. Wertenberger	.95	2.65	1.45	.34	1.21	1.45	1.12	2.84	1.87
Average	1.10	1.45	1.64	.64	.91	1.64	1.20	1.65	1.83

Figure No. 19

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Kneeling. 20 Round Burst. 15 yards.

Each figure shows average mean radius of three (3) shot groups (20 Rds each)

	EM-2	FN	T-25
1. Thwaites	.81	.75	1.08
2. Roberts	.52	.59	1.10
3. Martin	.82	.83	1.13
4. White	.55	.74	.78
5. Grigg	.97	.72	.82
6. Foxworth	.64	.91	1.00
7. Herrin	.65	.54	1.02
8. MacIntyre	.72	.73	.80
Average (Experts)	.71	.73	.97
9. Paradis	.91	1.09	.63
10. Paille	1.51	.84	1.69
11. McMinamen	1.03	.82	1.09
12. Moffatt	.55	.75	1.06
13. Cattral	1.23	.81	1.03
14. Wilson	.71	.82	1.11
15. Wertenberger	.84	.93	1.12
Average (other firers)	.97	.87	1.10
Average (all firers)	.83	.79	1.03

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	2.98	3.02	3.92	2.06	1.66	1.97	3.29	3.21	4.06
2. Roberts	1.87	2.37	3.34	1.62	1.34	3.13	2.09	2.73	4.14
3. Martin	3.49	2.82	4.38	1.90	2.93	2.86	3.69	3.26	4.82
4. White	2.22	3.05	2.65	1.32	2.33	1.66	2.37	3.33	2.75
5. Grigg	2.90	2.73	3.51	2.18	1.82	1.67	3.30	3.19	3.88
6. Foxworth	2.65	2.06	3.43	1.71	2.84	2.18	3.07	3.56	3.60
7. Herrin	3.15	2.37	3.08	1.05	1.50	2.42	3.27	2.80	3.52
8. MacIntyre	2.35	2.33	2.91	2.00	3.02	1.91	3.12	3.69	3.17
9. Paradis	2.68	3.62	2.63	2.31	3.40	1.40	3.16	3.95	2.87
10. Paille	3.93	3.22	4.04	2.11	2.19	3.58	4.17	3.75	4.72
11. McMinamen	3.92	2.52	3.19	1.60	1.91	1.88	3.94	2.73	3.58
12. Moffatt	2.20	3.21	3.44	1.37	1.97	1.62	2.49	3.60	3.25
13. Wilson	4.32	3.16	3.26	3.38	1.41	2.31	4.33	3.32	3.46
14. Cattral	2.56	3.37	3.22	1.57	2.24	2.80	2.75	3.89	4.36
15. Wertenberger	4.09	2.76	3.40	2.62	2.68	2.91	4.67	3.53	3.97
Average	3.02	2.84	3.36	1.92	2.22	2.29	3.31	3.37	3.74

Figure No. 20

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Standing. 20 Round Burst. 15 yards.

Each figure shows average mean radius of three (3) shot groups (20 Rds each)

	EM-2	FN	T-25
1. Thwaites	.67	.82	1.03
2. Roberts	.90	.83	.86
3. Martin	1.13	1.16	1.52
4. White	.68	1.16	.63
5. Grigg	.87	.78	.86
6. Foxworth	.55	.73	1.15
7. Herrin	.68	.74	.56
8. MacIntyre	.77	.80	.81
Average (Experts)	.78	.88	.93
9. Paradis	.79	1.00	.89
10. Paille	1.11	1.13	2.16
11. McMinamen	.68	1.09	1.05
12. Moffatt	.86	1.00	.94
13. Cattral	1.37	1.05	1.25
14. Wilson	.79	.92	1.28
15. Wertenberger	.84	.87	1.18
Average (other firers)	.92	1.01	1.25
Average (all firers)	.85	.94	1.08

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	2.92	3.01	2.73	1.74	2.19	3.17	3.04	3.25	3.65
2. Roberts	3.13	2.39	2.50	1.97	1.81	2.25	3.18	3.20	2.94
3. Martin	2.26	3.16	3.24	2.62	3.33	3.47	3.41	4.04	4.63
4. White	2.14	3.35	1.96	1.99	2.00	1.48	2.67	3.65	2.41
5. Grigg	2.72	1.89	2.61	1.99	2.03	2.51	3.07	2.34	3.23
6. Foxworth	2.18	2.45	3.17	1.54	2.12	3.04	2.27	2.91	3.90
7. Herrin	1.65	2.11	1.40	2.06	1.99	1.68	2.32	2.85	1.92
8. MacIntyre	2.07	2.54	2.61	2.16	3.63	2.15	2.71	3.45	2.84
9. Paradis	2.83	3.75	2.36	1.77	2.86	2.51	3.31	4.47	3.13
10. Paille	3.57	3.17	3.13	2.69	2.54	2.69	3.70	3.25	3.40
11. McMinamen	3.07	2.90	4.04	1.69	1.92	2.17	3.40	3.13	4.28
12. Moffatt	2.26	4.09	2.34	2.24	1.90	2.66	3.06	4.24	3.12
13. Wilson	3.62	2.97	2.33	3.22	3.05	2.77	4.46	3.73	3.35
14. Cattral	2.41	2.25	3.37	2.34	3.46	3.74	3.08	3.74	4.09
15. Wertenberger	3.41	3.13	3.93	1.98	2.75	3.01	3.65	3.79	4.11
Average	2.68	2.88	2.78	2.13	2.51	2.62	3.16	3.47	3.40

Figure No. 21

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Inclosure No. 1, T-8

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Prone. 20 Round Burst. 50 yards

Each figure shows average mean radius of 3 shot groups (20 Rounds each)

	EM-2	FN	T-25
1. Thwaites	.49	1.10	2.89
2. Roberts	.98	1.83	1.25
3. Martin	.69	1.04	1.25
4. White	.65	1.28	.98
5. Grigg	1.07	1.45	2.31
6. Foxworth	1.81	1.40	1.34
7. Herrin	.84	.98	1.16
8. MacIntyre	1.01	.76	1.59
Average (Experts)	.94	1.23	1.60
9. Paradis	.65	1.50	2.46
10. Paille	.69	2.80	1.98
11. McMinamen	1.84	1.48	2.23
12. Moffatt	.66	.93	2.53
13. Cattral	.51	1.68	2.43
14. Wilson	.99	2.88	1.61
15. Wertenberger	.83	1.23	1.78
16. Gordon	.94	2.06	1.79
Average (other firers)	.89	1.82	2.10
Average (all firers)	.92	1.53	1.85

	Maximum Horizontal Dispersion			Maximum Vertical Dispersion			Maximum Spread		
	EM-2	FN	T-25	EM-2	FN	T-25	EM-2	FN	T-25
1. Thwaites	1.75	2.35	4.86	1.80	3.31	3.51	2.60	3.51	5.70
2. Roberts	2.40	3.70	3.63	1.80	2.44	1.96	2.70	3.95	4.33
3. Martin	2.03	2.19	4.10	2.08	3.17	3.80	2.67	3.36	4.62
4. White	2.54	2.41	2.95	1.84	3.67	2.62	3.01	3.83	3.49
5. Grigg	3.49	3.61	3.72	3.00	2.94	2.46	4.09	4.55	3.78
6. Foxworth	3.00	3.87	4.74	2.25	2.37	2.13	3.61	4.11	4.87
7. Herrin	2.93	3.10	4.33	2.16	3.24	1.99	3.26	3.81	4.70
8. MacIntyre	2.77	1.75	2.43	1.86	2.50	1.92	3.43	2.55	2.90
9. Paradis	2.38	4.54	4.03	1.73	2.73	3.25	2.64	4.81	4.50
10. Paille	2.58	3.76	4.04	2.12	2.25	3.17	2.79	3.93	4.58
11. McMinamen	3.76	4.39	5.15	2.33	3.14	3.35	4.43	4.66	5.43
12. Moffatt	2.33	3.43	3.43	1.64	1.83	1.56	2.44	3.51	3.64
13. Cattral	1.84	3.76	4.45	1.16	1.79	2.90	2.20	3.99	4.52
14. Wilson	3.30	4.47	3.68	2.86	3.78	1.89	3.94	5.62	3.86
15. Wertenberger	2.22	3.01	3.82	2.29	4.00	2.60	2.69	4.53	4.05
16. Gordon	2.95	3.85	5.29	2.98	3.71	1.99	3.34	4.41	5.90
Average	2.64	3.39	4.04	2.12	2.93	2.57	3.12	4.07	4.43

Figure No. 22

Inclosure No. 1, T-8

Test No. 9:

1. Purpose: To determine the average number of hits obtained under simulated combat conditions with the rifles.

2. Method: This test was divided into two phases, one for Semi-automatic fire and one for Automatic fire.

Phase I - (Semi-automatic Fire)

a. Method:

(1) The U. S. Rifle M-1 was used as a control weapon.

(2) Sixteen riflemen, experts and marksmen, throughly trained in firing the test rifles fired the test.

(3) Each rifleman fired the course twice with each type of rifle.

(4) Each rifleman zeroed each of his rifles at 300 yards before each firing.

(5) The rules governing the conduct of the test were as follows:

(a) A diagram of the field target range used is shown in figure 9 with additional data in figure 1.

Lane Number	Range (Yds.)	Time (Sec.)	Shots	Target	Position
1	150 & 275	60	4	E	Foxhole
2	200 & 350	60	4	E	Rubble Pile
3	275 & 400	60	4	E	Stump
4	175 & 325	60	4	E	Window
5	225 & 350	60	4	E	Prone
6	500	60	4	B	Prone
7	125 & 400	60	4	E	Barricade
8	250 & 350	60	4	E	Ditch
9	175 & 325	60	4	E	Roof Top
10	125 & 275	60	4	E	Wall

Figure No. 1

(b) Firing Procedure:

1. All firing except at the target in lane 6 was with the battle sight (300 yards zero). The position assumed by the firer conformed to the principles of rifle marksmanship used in the known distance phase of the course. (Test 6).

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2. For firing at the target in lane 6, the firer estimated the range, set his sights accordingly, and fired.

3. Firing was without the loop sling. The firer was permitted, if he desired, to use the hasty sling.

4. Each target was exposed for a maximum of one minute.

5. "E" silhouettes were used in all lanes except lane 6. For this lane a 6 ft. x 6 ft. B target, representing the front of a motor vehicle, was used.

6. The moving targets in lane 5 traversed from right to left.

7. The ranges in the diagram (Fig.9) are approximate.

8. Each firer was allowed four rounds of ammunition for each lane. A maximum of two rounds was used against the first target exposed in each lane except lane 6 where all four were used.

9. A coach was present at each line. The firer loaded a partial clip of four rounds and assumed the firing position prescribed for that lane. The coach signaled the control point to have the pit operators display either of the two targets in the lane. The firer engaged the target. If hit, the target was twirled, pulled down at once, and the control point caused the other target in that lane to be exposed. The firer then proceeded to the next lane, and a new man came up to lane 1; this procedure was continued throughout all ten lanes. The Coach scored the firer in all lanes.

10. In lane 5 the firer fired two rounds at each moving target during the traverse. The pit operators recorded the number of hits and phoned the results to the coach through the control point.

11. In lane 6 the firer estimated the ranges, set his sight accordingly and fired 4 rounds of sustained fire at the B target. All hits within the 3 ring were scored by the pit operators and reported to the control point.

12. In order to require the firer to search for the targets in each lane, the sequence of exposing the targets in each lane was not fixed

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13. Scoring:

a. Lanes 1, 2, 3, 4, 7, 8, 9 and 10:

For each hit	5 points
For each unexpended round if both targets are hit	5 points
Possible points for each lane	20 points

b. Lanes 5 and 6:

For each hit	5 points
Possible points for each lane	20 points

c. Total possible points for course 200 points

d. Ricochets were scored as hits.

b. Results:

(1) Total For All Firers

Rifle	Rds.Fired	Hits	Rds.Saved	Score (Possible 6400)
EM-2	1052	459	228	3300
FN	1020	501	260	3590
M-1	1001	576	279	4105
T-25	961	612	319	4575

Figure No. 2.

(2) Averate For All Firers

Rifle	Rds.Fired	Hits	Rds.Saved	Score (Possible 200)
EM-2	32.8	14	7.1	103 (51.5%)
FN	31.8	16	8.1	112 (56%)
M-1	31.2	18	8.4	128 (64%)
T-25	30.0	19	9.7	143 (71.5%)

Figure No. 3

(3) Percentage of Targets Hit to Rounds Fired:

EM-2	FN	M-1	T-25
44%	49%	58%	63.8%

Figure No. 4

(4) Detailed results are shown in Figure No. 10.

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Phase II - (Automatic Fire)

a. Method:

(1) Sixteen riflemen, experts and marksmen, thoroughly trained in firing the test rifles in automatic fire were used in this test.

(2) Each rifleman fired the course twice with each type rifle with bipod.

(3) Each rifleman zeroed each of his rifles at 300 yards prior to each firing.

(4) The rules governing the conduct of the test were as follows:

(a) A diagram of the field target range used is shown in Figure 11, and additional data in Figure 5.

Lane Number	Time (Seconds)	Total Shots	Targets	Remarks
1	7 seconds per silhouette	20	4 Type "E" silhouettes	1 Magazine, 20 rds., in bursts of two or three.
2	8 seconds each moving target; 10 seconds for "B" target.	20	2 moving targets ("E"silhouettes) and one "B"target.	1 Magazine, 20 rds., in bursts of two or three.
3	20 seconds per target.	40	2 targets, each group consisting of 3 M.G. panels as individual targets.	2 Magazines, 20 rds., each, in bursts of two or three.

Figure No. 5

(b) Lane and Target arrangement:- Targets in the three lanes were arranged as shown in Figure 11.

1. Lane No. 1: The four targets in this lane were single "E" type silhouettes staggered between 150 and 400 yards. The firing point was a foxhole.

2. Lane No. 2: The two moving targets in this lane consisted of two silhouettes. The distance each target traversed was fifteen feet. One was located at a range of 200 yards; the other at a range of 400 yards. The known distance "B" target described in Par. 8, below, was located at a range of approximately 500 yards. The firer assumed the prone

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position for this lane.

3. Lane No. 3: This lane contained a lateral and a diagonal group of targets at ranges of 200 and 300 to 400 yards, respectively. Each group consisted of three machine gun panels, with one "E" type silhouette centered in the panel as an aiming point, so arranged that the three panels in each target group were operated simultaneously. The firing point for this lane was an open window.

(c) Conduct of Fire:

1. The firing line was controlled by an Officer-in-Charge, who was assisted by an NCO at each firing point.

2. The responsibilities of the NCO assistant were as follows:

   a. To insure that principles governing record pratice were observed by the gunner.

   b. To receive and record individual scores as obtained by the control point operators.

3. All firing was done with the battle sight, except where specifically noted.

4. The following procedure was used in controlling the firing line:

   a. On command from the Officer-in-Charge, each gunner assumed his position and examined his gun in preparation for firing.

   b. After the gunners had signalled "Ready" the Officer-in-Charge gave the command "WITH BALL CARTRIDGES, LOAD. COMMENCE FIRING!"

      I. Lane No. 1: Upon the command "COMMENCE FIRING" the control point operator signalled any one of the four silhouettes in his lane to appear. After seven seconds, the target was lowered and another raised. This procedure was repeated until all four silhouettes had been engaged.

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II. Lane No. 2: Upon the command "COMMENCE FIRING" the control point operator signalled either of the moving targets. After an exposed time of eitht seconds the other moving target was signalled to appear. In engaging the "B" target the gunner estimated the range, set his sights accordingly and fired his remaining ammunition.

III. Lane No. 3: Upon the command "COMMENCE FIRING" the control point operator signalled either the lateral or diagonal target to appear. After expending one magazine of 20 rounds, or on the disappearance of the target being engaged, the gunner reloaded immediately in preparation for engaging the second target. Each target was exposed until one magazine had been expended or for twenty seconds. The time lapse between the disappearance of one target and the appearance of another target was kept to the minimum required for the gunner to reload.

c. After the disappearance of the last target, control reverted to the Officer-in-Charge on the command "CEASE FIRING, CLEAR RIFLES." On signal from the Officer-in-Charge that the firing line had been cleared and checked, the control point operator commanded the target detail to mark targets.

(d) Marking of Targets: On receiving the command "MARK TARGETS" each target operator displayed a red flag at his pit. He then proceeded to his assigned target, recorded the hits on a pit score card, and marked each bullet hole on each silhouette. After marking each target he returned to his pit, removed the red flag, and transmitted the number of hits on each target to the control point operator.

(e) Scoring: The rules governing the scoring were as follows:

1. Lane No. 1: Five points for each silhouette hit and one point for each hit up to five, maximum, in each silhouette. Maximum possible score for entire lane, 40 points.

2. Lane No. 2: Five points for each moving target (2 silhouettes) hit, and one point for each hit up to six, maximum. Five points for hitting the "B"

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target (within "3" ring. Maximum possible score for the entire lane, 33 points. This gave the firer two extra rounds.

3. Lane No. 3: Five points for each panel hit and one point for each hit up to six, maximum in each panel. Maximum possible score for the entire lane, 66 points. With two magazines of 20 rounds each, this gave the firer two extra rounds,

b. Results:

(1) Total For All Firers

Rifle	Rounds Fired	Hits	Score
EM-2	2560	833	2368
FN	2560	978	2451
T-25	2560	833	2181

Figure No. 6

(2) Average For All Firers

Rifle	Rounds Fired	Hits	Score (Possible 139)
EM-2	160	26	74 (53.2%)
FN	160	31	77 (55.4%)
T-25	160	26	68 (48.9%)

Figure No. 7

(3) Percentage of Targets Hit to Rounds Fired

EM-2	FN	T-25
32.9%	38.2%	32.9%

Figure No. 8

(4) Detailed results are in Figure No. 12.

3. Analysis:

a. In Semi-automatic fire under simulated combat conditions the order of merit of the test rifles in percentage of hits was T-25, FN and EM-2. The T-25 was the only test rifle superior to the M-1 and it was markedly superior to the FN and EM-2.

b. In Automatic fire, based on percentages of hits, the order was FN, EM-2, and T-25. The FN was considerably better than the EM-2 and T-25 which were approximately equal in percentage of hits produced. (App. F-14)

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CON

TEST 9, PHASE I
FIELD TARGET RANGE - SEMIAUTOMATIC FIRE

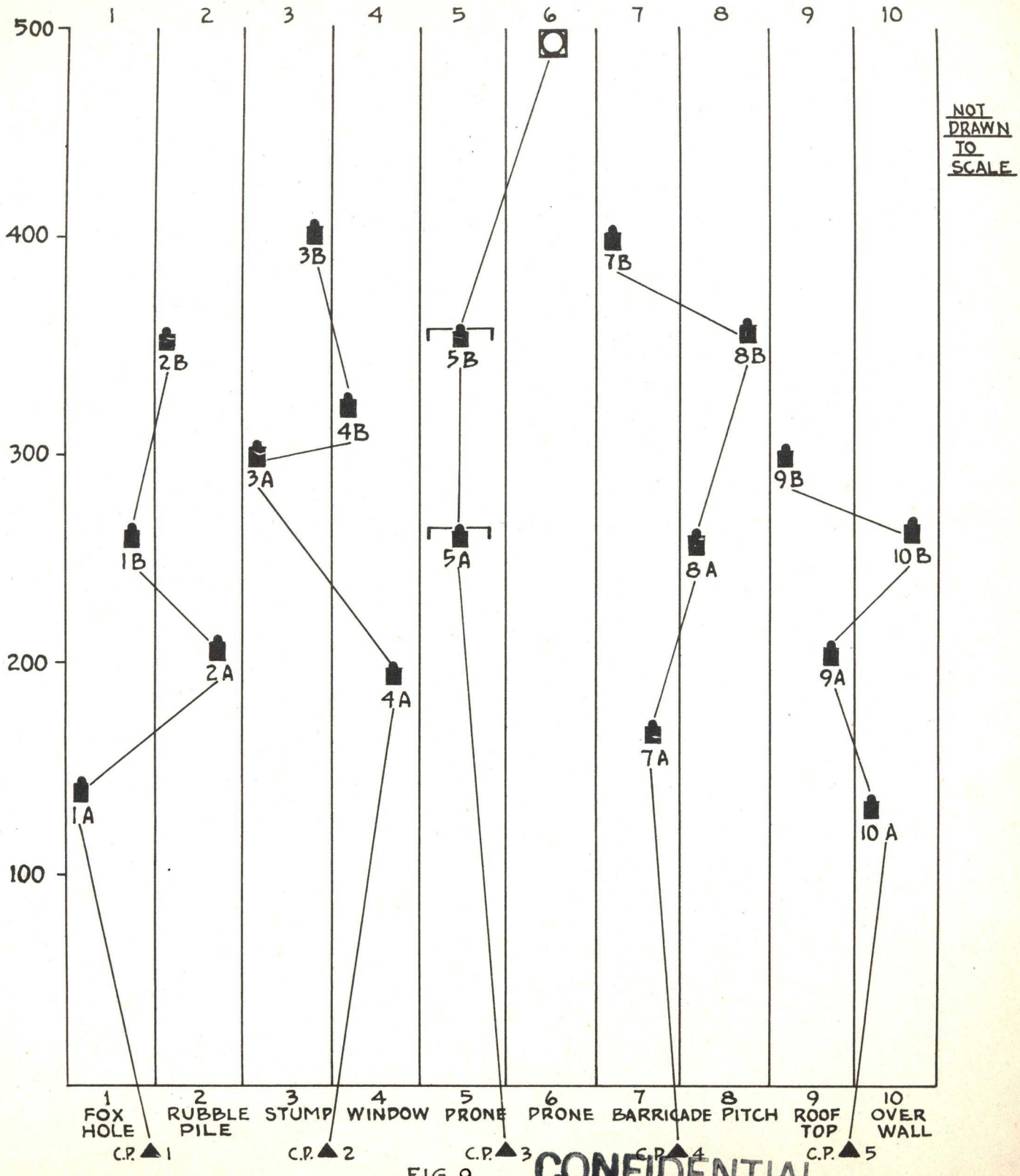

FIG. 9

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Test No. 9:

Combat Target Firing

	EM-2			HN			M-1			T-25		
	Rds Saved	Hits	Score	Rds Saved	Hits	Score	Rds Saved	Hits	Score	Rds Saved	Hits	Score
Thwaites	11	18	145	13	18	145	8	23	155	15	24	195
	11	19	140	10	22	155	14	21	165	14	22	175
Johnson	9	19	135	10	16	115	7	19	130	13	23	175
	6	13	90	7	15	105	10	19	145	6	16	100
McCoy	2	8	50	9	13	105	6	13	95	10	16	115
	9	13	95	4	10	70	9	18	130	4	15	90
White	10	15	125	12	16	140	10	18	135	15	25	200
	9	16	115	5	12	75	11	21	155	14	24	190
Grigg	11	17	135	5	15	100	13	23	180	11	23	170
	11	21	155	7	20	130	8	20	140	13	18	155
Foxworth	10	17	125	11	15	125	6	14	90	10	21	155
	6	10	80	7	15	105	12	23	170	7	13	90
Wideman	7	16	115	7	16	120	3	12	60	11	16	125
	6	14	85	11	13	105	11	15	130	6	16	115
MacIntyre	4	10	60	2	12	70	7	21	130	12	23	175
	9	18	120	6	19	115	13	21	165	12	22	160
Gordon	5	8	60	4	12	80	10	20	145	7	18	120
	12	14	125	8	14	95	5	12	90	9	14	100
Paradis	6	12	90	3	9	60	9	15	115	12	20	155
	9	17	125	11	24	170	7	15	105	9	20	135
Paille	9	16	115	9	20	140	9	19	135	11	23	165
	8	14	95	14	21	165	8	22	150	10	22	160
McMinamen	8	18	130	8	19	135	10	16	120	11	22	165
	8	19	130	5	10	75	10	19	140	10	22	165
Moffatt	8	10	80	5	14	85	7	13	95	5	13	90
	10	14	110	8	17	120	7	14	105	5	10	60
Cattral	5	9	55	9	18	135	3	12	65	12	19	150
	4	14	90	7	12	90	5	12	85	9	13	110
Wilson	5	10	65	10	18	135	5	20	105	12	21	165
	2	9	55	7	16	105	12	23	175	12	19	150
Wertenberger	8	14	105	9	13	100	10	21	145	8	22	145
	5	17	100	7	17	120	9	22	155	14	17	155
Average	7.1	14	103	8.1	16	112	8.4	18	128	9.7	19	143

Figure No. 10

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TEST 9, PHASE II
FIELD TARGET RANGE AUTOMATIC FIRE

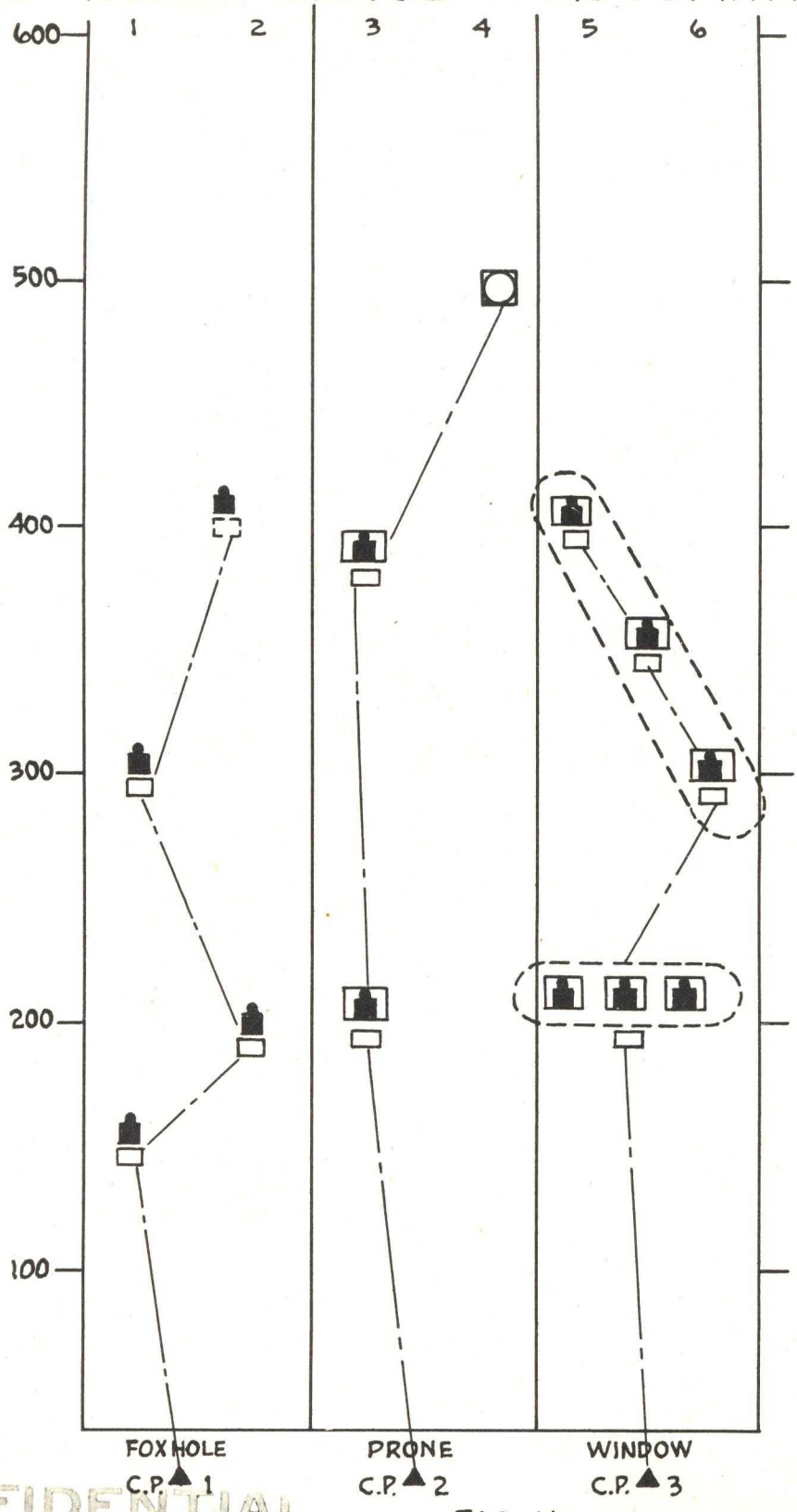

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FIG. 11

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Test No. 9:

Combat Target Firing

	EM-2		FN		T-25	
	Hits	Score	Hits	Score	Hits	Score
1. Thwaites	16	56	42	107	25	75
	30	90	38	98	32	92
2. Johnson	31	81	24	74	19	74
	24	64	25	65	21	66
3. McCoy	10	50	27	72	28	73
	33	93	36	86	27	82
4. White	32	87	29	94	27	77
	36	91	36	81	18	48
5. Grigg	40	90	24	74	25	85
	36	86	41	101	25	70
6. Foxworth	17	47	31	76	24	79
	25	70	36	81	25	90
7. Wideman	30	80	21	66	21	71
	34	84	25	75	21	51
8. MacIntyre	30	80	23	63	17	67
	26	66	22	72	17	67
9. Gordon	28	78	27	67	20	60
	28	78	22	72	19	59
10. Paradis	20	70	36	101	20	65
	24	74	21	56	22	72
11. Paille	26	66	27	77	24	59
	29	84	30	95	26	76
12. McMinamen	10	50	23	73	20	55
	13	43	19	69	8	33
13. Moffatt	30	80	27	77	26	71
	32	92	25	75	24	64
14. Cattral	29	84	30	85	28	73
	16	56	29	84	21	76
15. Wilson	19	59	40	100	14	49
	24	74	32	87	36	86
16. Wertenberger	28	88	25	24	69	33
	27	77	85	24	84	83
Average	26	74	31	77	26	68

Figure No. 12

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Test No. 10:

1. Purpose: To determine the comparative accuracy of the test rifles at the maximum rate of semi-automatic and automatic aimed fire.

2. Method:

a. The U. S. Rifle M-1 was used as a control item only in semi-automatic fire.

b. The sixteen firers employed in Test No. 6, Phase II, fired this test.

c. Before the test began, all firers were given a brief drill in changing magazines with each rifle.

d. Each man fired one rifle of each type once at each range.

e. An unlimited supply of ammunition was allowed to each man.

f. Time allowed for firing was one minute.

g. Semi-automatic firing was from the prone position, with loop sling, at 200 yards.

h. Automatic firing with the bipod was in 2 and 3 round bursts from the prone position at 50 yards.

i. Automatic firing without bipod was in 2 and 3 round bursts from the prone position, with loop sling, at 50 yards.

j. With the exception of automatic fire without bipod at 50 yards - in which case a 6 x 10 ft target was used - all targets were 6 x 6 ft. Hits anywhere on the targets were counted.

3. Results:

a. SEMI-AUTOMATIC FIRE - 200 Yards
(Average for 16 Firers. MR in Feet)

Rifle	Total Rounds Fired	Hits	Percentage of Hits	MR
EM-2	41.4	36.2	87.4	1.33
FN	43.2	40.2	93.2	1.01
M-1	31.2	29.2	93.6	.90
T-25	42.4	40.4	95.3	.78

Figure No. 1

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b. AUTOMATIC FIRE W/BIPOD - 50 Yards
(Average for 16 Firers, MR in Feet)

Rifle	Total Rounds Fired	Hits	Percentage of Hits	MR
EM-2	85.2	79.4	93.2	.95
FN	65.7	62.1	94.6	.89
T-25	80.2	75.0	93.6	.90

Figure No. 2

c. AUTOMATIC FIRE W/O BIPOD - 50 Yards
(Average for 16 Firers, MR in feet)

Rifle	Total Rounds Fired	Hits	Percentage of Hits	MR
EM-2	69.1	62.8	90.9	1.65
FN	58.4	55.7	95.3	1.11
T-25	55.9	37.4	66.9	2.74

Figure No. 3

d. Detailed results are enclosed in tabular form as Figures 4, 5 and 6.

4. Analysis:

a. In semi-automatic fire the T-25 was better than the control weapon (M-1) in rounds per minute and in accuracy (in percentage of hits) while the FN and the EM-2 were better than the control weapon in rounds fired per minute but not so good in accuracy (in percentage of hits). In hits per minute the order of merit was first T-25 and FN (approximately equal), second EM-2, third M-1.

b. In automatic fire with the bipod the EM-2 was better in rounds fired per minute than the T-25 and much better than the FN, but in accuracy (in percentage of hits) the three weapons were approximately equal. Based on hits per minute the T-25 and EM-2 were approximately equal and considerably better than the FN.

c. In automatic fire without the bipod the EM-2 was considerably better in rounds fired per minute than the FN and T-25, which were approximately equal; but the FN was more accurate (in percentage of hits) than the EM-2 and much more accurate than the T-25. In hits per minute the order of merit was first EM-2, second FN, third, and much the poorest, T-25.

d. The overall effectiveness in automatic fire with and without bipod, considering accuracy (in percentage of hits) and hits per minute, was first, EM-2, second FN and third T-25.

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e. In automatic fire without the bipod there was a significant loss of accuracy (27% in percentage of hits) in the T-25 which was not present with the other two weapons.

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Test No. 10:

Automatic Fire with Bipod. 50 yards. Unlimited Ammunition for 1 minute.

	EM-2		FN		T-25	
	Total Fired	Hits	Total Fired	Hits	Total Fired	Hits
1. McMinamen	42	42	60	60	60	60
2. McCoy	48	41	60	55	38	37
3. Thwaites	120	120	120	120	88	78
4. Moffatt	55	51	64	59	100	100
5. Roberts	109	80	80	48	80	60
6. Cattral	115	113	76	74	100	100
7. Prestridge	80	76	80	80	60	60
8. MacIntyre	88	80	73	70	78	60
9. Paille	84	84	73	71	79	70
10. White	90	87	99	99	100	100
11. Gordon	62	59	59	59	100	100
12. Coulas	78	72	77	72	51	50
13. Foxworth	100	99	80	78	80	77
14. Herrin	120	111	--	--	100	100
15. Paradis	111	100	--	--	100	95
16. Wilson	60	55	51	49	70	53
Average	85.2	79.4	65.7	62.1	80.2	75.0
Average Percentage	93.2		94.6		93.6	

Mean Radius	EM-2	FN	T-25
1. McMinamen	.68	.51	.61
2. McCoy	1.34	.91	.77
3. Thwaites	.63	.28	.99
4. Moffatt	.91	1.04	.43
5. Roberts	2.00	2.74	1.74
6. Cattral	.94	.70	.44
7. Prestridge	.90	.39	.33
8. MacIntyre	.88	.53	1.51
9. Paille	.51	1.17	1.23
10. White	.83	.72	.40
11. Gordon	.83	.62	.66
12. Coulas	1.11	.90	.64
13. Foxworth	.86	.63	1.71
14. Herrin	.89	---	.41
15. Paradis	1.07	---	.71
16. Wilson	.78	.68	1.59
Average	.95	.84	.89

Figure No. 4

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Test No. 10:

Automatic Fire without Bipod. 50 yards. Unlimited Ammunition for 1 minute.

	EM-2		FN		T-25	
	Total Fired	Hits	Total Fired	Hits	Total Fired	Hits
1. McMinamen	60	53	80	76	60	37
2. McCoy	60	58	40	40	40	24
3. Thwaites	63	56	57	57	53	48
4. Moffatt	69	69	80	80	80	53
5. Roberts	70	70	55	53	60	37
6. Cattral	63	57	52	50	52	30
7. Prestridge	65	62	60	60	32	13
8. MacIntyre	75	72	60	53	60	55
9. Paille	64	44	56	53	38	25
10. White	78	68	40	40	52	26
11. Gordon	75	75	51	50	62	46
12. Coulas	60	59	60	53	60	52
13. Foxworth	70	70	60	60	60	32
14. Herrin	86	81	62	62	80	49
15. Paradis	76	72	74	65	60	43
16. Wilson	72	38	48	39	45	29
Average	69.1	62.8	58.4	55.7	55.9	37.4
Average Percentage	90.9		95.3		66.9	

Mean Radius	EM-2	FN	T-25
1. McMinamen	1.39	1.26	3.02
2. McCoy	1.50	.63	3.18
3. Thwaites	1.94	1.21	1.61
4. Moffatt	.69	.83	2.77
5. Roberts	.87	.88	2.57
6. Cattral	1.78	.81	2.75
7. Prestridge	1.89	.63	3.97
8. MacIntyre	1.49	1.41	1.42
9. Paille	2.62	.91	3.13
10. White	2.28	.96	3.55
11. Gordon	.85	1.27	2.35
12. Coulas	1.01	1.42	1.61
13. Foxworth	1.32	.95	3.50
14. Herrin	2.02	.78	3.17
15. Paradis	1.61	1.80	2.47
16. Wilson	3.07	2.00	2.70
Average	1.65	1.11	2.74

Figure No. 5

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Test No. 10:

Semi-automatic. 200 yards. Unlimited Ammunition for one minute.

	EM-2		FN		M-1		T-25	
	Total Fired	Hits	Total Fired	Hits	Total Fired	Hits	Total Fired	Hits
1. McMinamen	34	30	42	42	34	30	52	51
2. McCoy	24	21	28	23	25	23	42	38
3. Thwaites	75	68	64	63	40	40	55	55
4. Moffatt	42	16	50	45	28	28	49	48
5. Roberts	46	40	68	52	32	20	26	23
6. Cattral	34	24	42	40	25	24	40	37
7. Prestridge	40	40	40	40	32	32	40	37
8. MacIntyre	28	24	38	37	24	20	32	32
9. Paille	33	33	40	36	28	25	40	40
10. White	40	40	40	40	26	26	46	45
11. Gordon	40	37	30	24	32	32	48	45
12. Coulas	40	37	38	37	25	25	37	37
13. Foxworth	44	42	36	31	40	40	29	29
14. Herrin	52	51	50	50	43	38	56	56
15. Paradis	43	38	45	45	35	35	42	40
16. Wilson	47	38	40	38	31	30	35	33
Average	41.4	36.2	43.2	40.2	31.2	29.2	42.4	40.4
Av. Percentage	87.4		93.2		93.6		95.3	

Mean Radius	EM-2	FN	M-1	T-25
1. McMinamen	1.44	1.39	1.18	1.09
2. McCoy	1.17	1.50	1.02	1.37
3. Thwaites	1.20	.64	.75	.67
4. Moffatt	3.49	1.13	.82	.62
5. Roberts	1.00	1.43	1.90	.68
6. Cattral	1.79	1.01	.72	.85
7. Prestridge	.90	1.18	.65	.84
8. MacIntyre	1.02	.54	.81	.37
9. Paille	.70	.86	.96	.72
10. White	.91	.50	.38	.71
11. Gordon	1.01	1.37	.51	1.00
12. Coulas	1.29	.78	.66	.79
13. Foxworth	1.08	1.26	.97	.48
14. Herrin	1.40	.93	1.15	.77
15. Paradis	1.53	.82	1.08	.78
16. Wilson	1.41	.86	.91	.80
Average	1.33	1.01	.90	.78

Figure No. 6

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Test No. 11:

1. Purpose: To determine the most effective semi- automatic and automatic rate of fire of the test rifles.

2. Method:

a. For the purpose of this test the term "most effective rate of fire" has been interpreted as being that rate of fire which gives maximum accuracy and maximum rapidity of fire without damaging the rifle.

b. To determine the most effective semi-automatic and automatic rates of fire, a study was made based on the results of Tests No. 6, 7, 8, 10 and 12.

3. Results:

a. Semi-automatic:

(1) (a) A consideration of the results of the accuracy firing in Test No. 6, Phases I and II, and Test No. 10 produces the following data:

200 Yards Prone Without Bipod
(MR in Feet)

R P M	EM-2	FN	T-25
4	.47	.47	.41
19	.57	.54	.44
42	1.33	1.01	.78

Figure No. 1

(b) This data shows that all test weapons can fire with accuracy at 42 rounds per minute for a limited time and that their accuracy at 19 rounds per minute is almost as good as at 4 rounds per minute.

(2) From the results of Test No. 12 it can be seen that

(a) All of the test weapons can fire at a rate of 15 rounds per minute for 30 minutes without damage.

(b) None of the weapons can fire at a rate of 20 rounds per minute for 30 minutes without damage.

(c) After approximately 180 rounds, all of the rifles will overheat to the extent that they cannot be held in the bare hand.

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(3) Therefore: The most effective rate in semi-automatic fire for the three test weapons is 15 rounds per minute for 30 minutes, provided that the hands are protected.

b. Automatic:

(1) A consideration of the results of the accuracy firing in Tests No. 7, 8, and 10 produces the following data:

(a) From Test No. 7.

100 Yards With Bipod
(MR in Feet)

Burst In Rds.	R P M	EM-2	FN	T-25
2 & 3	15	1.03	.65	.67
5	25	1.13	.91	.87
20	60	.98	.99	.96

Figure No. 2.

(b) From Test No. 8:

50 Yards Without Bipod
(MR in Feet)

Bursts In Rds.	R P M	EM-2	FN	T-25
2 & 3	15	1.25	.85	1.71
5	25	1.46	1.50	1.95
20	60	.92	1.53	1.85

Figure No. 3

(c) From Test No. 10:

50 Yds. Unlimited Ammunition For One Minute
2 & 3 Round Bursts

Bipod	EM-2 (85 RPM)	FN (66 RPM)	T-25 (80 RPM)
With	.69	.85	.56
Without	1.65	1.11	2.74

Figure No. 4

(2) The above data shows that:

(a) Five round bursts are the least accurate and 2 and 3 round bursts are the most accurate.

(b) Accuracy is maintained up to 60 rounds per minute, but over this rate, accuracy decreases rapidly.

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(c) Therefore, a rate of fire of 60 rounds per minute, in 2 & 3 round bursts is the most effective rate - if it can be maintained.

(3) Test No. 12, however, produced the following results:

(a) All test weapons can fire 40 rounds per minute in two and three round bursts for 5 minutes without damage.

(b) None of the test weapons can fire at the rate of 60 rounds per minute in two and three round bursts for 5 minutes without damage.

(c) After approximately 180 rounds, all of the weapons are too hot to hold in the bare hand.

(4) Therefore: The most effective rate in automatic fire for the test weapons is 40 rounds per minute for five minutes in two and three round bursts, provided the hands are protected.

4. Analysis:

a. The most effective rate of fire of the test weapons in semi-automatic fire is 15 rounds per minute for 30 minutes.

b. The most effective rate of fire of the test weapons in automatic fire is 40 rounds per minute for five minutes.

c. In both semi-automatic and automatic fire, the maximum effective rate and the maximum sustained rate of the test weapons are identical.

Test No. 12:

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1. Purpose: To determine the approximate semi-automatic and automatic sustained fire capabilities of the test rifles.

2. Method:

a. All tests were started with rifles at abient temperature. Firing was at a range of 200 yards. The test was run once, using one rifle of each type.

b. (1) Each rifle was fired in semi-automatic fire at the rate of fifteen rounds per minute for 30 minutes.

(2) Each rifle was fired in semi-automatic fire at the rate of twenty rounds per minute for 30 minutes.

c. (1) Each rifle was fired automatically at a rate of sixty rounds per minute for five minutes, or until malfunction occurred attributable to the test, or until the target was obscured by smoke.

(2) Each rifle was fired automatically at the rate of forty rounds per minute for five minutes, or until malfunction occurred attributable to the test, or until the target was obscured by smoke.

d. During the test a record was made of radiant sun temperature, barometric pressure, all malfunctions, the number of rounds at which heat was felt, and when heat became excessive, the degree of smoking at various stages and when mirage became excessive.

3. Results:

a. Semi-automatic, 15 rounds per minute for 30 minutes:

(1) The three light rifles under test were each capable of maintaining a semi-automatic rate of fire of 15 rounds per minute for 30 minutes, providing the firer was equipped with gloves or a rest for the muzzle of the rifle.

(2) The forward hand grips of all test rifles became too hot to hold with the left hand unprotected; and, in the case of the EM-2, the trigger became hot enough to blister an unprotected finger.

(3) Smoke produced from the rifles did not obscure the target.

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b. Semi-automatic, 20 rounds per minute for 30 minutes:

(1) Both the EM-2 and FN maintained this rate but in each case the handguard was charred on the inside. Towards the end of the test smoke and mirage from the barrels made accurate aiming extremely difficult.

(2) With the T-25, at 529 rounds (approximately 27 minutes) the front handguard fell off. On examination it was found to be badly charred; the thin portion at the front end which fits under the retaining band was charred to the extent that a holding surface no longer existed.

c. Automatic fire, 60 rounds per minute for 5 minutes:

(1) Both the EM-2 and FN maintained this rate for 5 minutes. Upon examination after firing, it was found that the woodwork of both rifles was charred slightly. No other damage was apparent.

(2) The stock of the T-25 burst into flames after 280 rounds.

d. Automatic fire, 40 rounds per minute for 5 minutes: All test rifles maintained this rate of fire without damage.

e. Throughout this test at all the various rates of fire employed, the incidence of stoppages with all guns was very low.

f. Detailed results are shown in inclosure 1.

4. Analysis:

a. All of the test rifles can maintain a sustained rate of semi-automatic fire of 15 rounds per minute for 30 minutes.

b. The EM-2 and FN can maintain a sustained rate of semi-automatic fire of 20 rounds per minute for 30 minutes. The T-25 is not capable of maintaining this rate of sustained semi-automatic fire.

c. All of the test rifles can maintain a sustained rate of automatic fire of 40 rounds per minute for 5 minutes.

d. The EM-2 and FN can maintain a sustained rate of automatic fire of 60 rounds per minute for 5 minutes. The T-25 can not maintain this rate of sustained automatic fire.

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e. The EM-2 was able to maintain this sustained rate of fire after firing about 140 rounds only because the firer was permitted to wear a glove on his trigger finger.

f. The forward hand grips of all the tested rifles became too hot to hold after firing about 180 rounds of sustained fire, both in semi-automatic and automatic firing.

TEST NO. 12 - RECORD OF RIFLE PERFORMANCE IN SUSTAINED FIRE CAPABILITIES

WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
T-25 #33	15 Rounds per minute. Semi-automatic	100	Stock getting quite warm.		Cocking handle was too hot to hold. Firer was not aware of this as he had no occasion to touch it after the stoppage at the 320th round. The gun was still in serviceable condition. The hand guard was split on top and had to be changed. There was a small split on the inside of the stock. Slight signs of charring inside the stock.	102° to 110
		120	Stock too hot to hold and shoot accurately without sandbag rest.			
		140	Stock too hot to grip with left hand. Firer continued by holding sling between hand and stock and using rest.			
		240	Some smoke issuing from around operating slide, also slight amount all along from joint between hand guards and stock.			
		300	Stock too hot to hold. Firer could only continue by resting rifle and steadying it with the sling.			
		320		Failed to feed 1st round of a new magazine.		
		450	Towards the end the smoke increased but did not inconvenience the firer.			
N #20	15 rounds per minute. Semi-automatic	10		Failed to feed, bolt not fully home.		
		100	Hand guard getting hot.		Split in rear end of hand guard about 3 inches long. Gas plug hard to remove The gun was still serviceable. Firer's face was slightly swollen just below cheek bone and very sore from contact with the butt.	100° at com ment - drop to 90° when went in, th to 110°.
		120	Hand guard too hot to hold and shoot accurately without resting the rifle.			
		140	Hand guard too hot to grip with left hand, firer continued by holding the sling between hand and hand guard and using sandbag rest.			
		160	Smoke from front end of hand guard around the gas block was noticeable when aiming.			
		180	Firer could no longer hold rifle with left hand. Firer could only continue by resting the rifle on sandbag rest and steadying by the sling.			
		200	Slight mirage from barrel affecting aiming.			
		220	Hand guard too hot to hold.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGES AND MALFUNCTIONS	CONDITIONS ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) FN #20	15 rounds per minute. Semi-automatic	220	Cocking handle too hot to hold.			
		280	Firer affected by smoke blowing in his face - a slight change in wind direction cleared this.			
		380	Smoke from forward end of hand guard increasing.			
		450	Completed.			
EM-2 #5	15 rounds per minute. Semi-automatic.	80	Front grip (fore-end) getting warm.	The breech failed to remain open after 1st, 2nd, 4th and 14th Magazines.	Front grip showed slight charring around gas block and barrel bearing. Weapon still serviceable.	100° to 116
		100	Trigger getting warm.			
		140	Trigger getting hot. Front grip getting uncomfortably hot for left-hand.			
		160	Trigger too hot to operate. From here on the firer wore a glove on his right hand.			
		180	Front grip too hot to hold and shoot accurately without a sandbag rest. Firer rested the rifle on the sandbag and steadied it by holding the sling.			
		200	Body of gun very warm to firer's cheek.			
		260	Considerable smoke from front end of front grip and from around the gas block.			
		300	Firer complained of smoke blowing in his face making aiming difficult. A slight change in wind direction cured this.			
		320	Smoke increasing from around the gas block, making aiming difficult.			
		355		Failure to feed. Bolt not fully closed.		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGES AND MALFUNCTIONS	CONDITIONS ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) EM-2 #5	15 rounds per minute. Semi-automatic.	380	Firer complained of heat from the body of the gun on his cheek.			
		450	Test completed.			
T-25 #34	15 rounds per minute. Semi-automatic.	80	Stock getting warm.		Front firing pin found to be broken. Slight crack in the stock (fore-end). Slight signs of charring in stock. Weapon serviceable.	96°
		100	Stock getting hot.			
		140	Stock getting uncomfortably hot.			
		180	Stock too hot to hold and shoot accurately without sandbag rest. Firer carried on with the sling resting between his hand and the stock and using the sandbags.			
		240	Considerable smoke issuing from full length of the stock and around the operating slide. A slight breeze kept it clear of the firer's vision.			
		280	Gun too hot to hold with left hand. Firer carried on by resting the rifle on the sandbags and steadying it by holding the sling.			
		300	Still considerable smoke but firer's aim unaffected.			
		323		Failure to feed (Over-ride).		
		422		Failure to feed. Bolt not fully closed.		
		450	Test completed			
FN #11	15 rounds per minute. Semi-automatic.	100	Handguard getting hot.		The gun was in serviceable condition. The handguard was slightly warped and showed signs of slight charring at the forward end around the gas block.	
		116		Fired 2 Rds automatic when set for semi-automatic.		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGES AND MALFUNCTIONS	CONDITIONS ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) FN #11	15 rounds per minute. Semi-automatic.	130	Mirage from barrel affecting aiming.		On stripping the gun for examination, the hand guard split in two. This was due to the slight warping and having to force the hand guard past the gas block. Had the gun not been stripped, this would not have occurred. The firer did not complain of any soreness in his cheek.	
		140	Hand guard too hot to hold and shoot accurately without sandbag rest. Firer continued by holding sling between hand and hand guard and using sandbags.			
		186		Failed to feed. Magazine spring jammed.		
		200	Hand guard too hot to hold. Firer could only carry on by resting the rifle on the sandbags and steady it by holding the sling.			
		260	Fair amount of smoke issuing from the hand guard mostly around the gas block.			
		285	Firer complained of smoke affecting his aiming.			
		360	Smoke considerably less.			
		405		Failure to feed magazine not held secure by catch.		
		420	Smoke almost nil.			
		450	Test completed.			
EM-2 #1	15 rounds per minute. Semi-automatic.	70	Front grip getting hot.		The gas cylinder slot in the front grip was slightly charred. The wooden seating for the barrel in the front	100°
		86	Trigger getting hot.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGES AND MALFUNCTIONS	CONDITIONS ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) EM-2 #1	15 rounds per minute. Semi-automatic.	100	Front grip too hot to hold and shoot accurately. Firer carried on by holding the sling between hand and front grip and using sandbag rest.		grip was burnt but still in position. Firing pin sleeve was found to be cracked.	
		110	Trigger too hot to operate. Firer had to wear glove.		The piston was found to be cracked.	
		120		Bolt failed to remain open on empty magazine.	The gun would have continued firing and was still considered to be serviceable.	
		180	Front grip too hot to hold. Firer could only continue by resting the rifle on the sandbag rest and steadying it by holding the sling.			
		200	Considerable smoke from front end of front grip - slight amount from rear end.			
		240		Failed to feed Bolt not fully home.		
		242		Failed to feed Bolt not fully home. Bolt failed to remain open.		
		320	Firer could feel heat from Trigger through fairly thick glove.			
		340	Smoke from around gas cylinder and gas block increasing. Firer complained that smoke was making aiming difficult.			
		360	Firer complained that trigger guard was getting very hot.			
		420		Bolt failed to remain open.		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGES AND MALFUNCTIONS	CONDITIONS ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) EM-2 #1	15 rounds per minute. Semi-automatic.	448		Failure to feed due to sear spring becoming misplaced		
		450	Test completed.			
M-1 #22	15 rounds per minute. Semi-automatic.	44		Failure to feed.	Front hand guard charred and burnt and split in two places. Rear hand guard charred and burnt. Also split. Elevating knob and screw found to have come off during firing.	116°
		72	Some smoke from around gas block, front end of stock and around operating slide.			
		128	Stock uncomfortably hot - Smoke increasing from full length of stock but less from around the gas block.			
		164	Firer complained of smoke interfering with aiming.			
		168	Stock too hot to hold and shoot accurately. Firer continued by resting the rifle on the sandbag rest and steadying by holding the sling.			
		192	Smoke very thick. With each round the whole rifle forward of the breech was enveloped in smoke. This cleared between shots and enabled the firer to aim but aiming was difficult.			
		234		Failure to feed.		
		242	Smoke making aiming very difficult.			
		250		Failure to feed.		
		259		Failure to feed.		
		280	Target only visible through smoke for fleeting glimpses.			
		284		Failure to feed.		
		290		Failure to feed.		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) M-1 #22	15 round per minute. Semi-automatic	291		Failure to feed		
		450	Test completed Note: For the last 250 rounds it was impossible to shoot accurately due to the difficulty of aiming through the smoke.			
T-25 #33	20 rounds per minute. Semi-automatic.	51		Failure to feed	Front hand guard badly charred and burnt. The thin portion which fits under the retaining band was completely burnt away. This caused the hand guard to fall off. The front firing pin was found to be broken but this did not cause the gun to stop. Apart from the burnt hand guard, the gun was considered to be serviceable.	90°
		90	Stock fore-end getting warm.			
		112	Stock fore-end getting hot.			
		160	Stock fore-end getting uncomfortably hot.			
		180	Too hot to hold rifle and shoot accurately. Firer carried on by resting the rifle on sandbags and steadying it by holding the sling.			
		240	Considerable smoke from fore-end, with each round fired a large puff of smoke appeared from around operating slide.			
		320	Smoke increasing from front end of fore-end occasionally obscuring the sights.			
		360	Puff of smoke from each round appearing around the operating slide becoming larger.			
		400	Increasing smoke making aiming very difficult. This was mainly due to a slight breeze drifting the smoke directly into the firer's face.			
		549	Forehand guard fell off.			
			Test abandoned.			
			For the last 200 rounds, aiming was very difficult.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
EM-2 #5	20 rounds per minute. Semi-automatic.	70	Front grip getting warm.		There was considerable charring at the front end of the gas cylinder slot in the front grip and around the barrel bearing.	95° - 100°
		90	Trigger getting warm.			
		100	Front grip uncomfortably hot.			
		115		Failure to eject.		
		120	Trigger very hot but firer could carry on.		Though the gun was still firing and was considered serviceable, it was thought that this rate was too high and would damage the weapon.	
		121		Failure to feed bolt not fully home.		
		140	Front grip too hot to hold and shoot accurately. Firer continued by holding sling between hand and front grip and using sandbag rest.		Could be maintained in an emergency. During the latter part of the test, smoke made accurate aiming extremely difficult.	
		180	Trigger too hot to operate. Firer had to put glove on.			
		200	Butt catch slipped. Allowed butt to rotate in shoulder.			
		260	Some smoke issuing from full length of front grip.			
		300	Front grip too hot to hold. Firer continued by resting the rifle on the sandbags and steadied it by holding the sling.			
		320	Increasing smoke from around the gas block and forward end of the front grip, making aiming difficult. A slight breeze drifted the smoke directly into the firer's face.			
		360		Bolt failed to remain open.		
		400	Heat from trigger could be felt through glove.			
		440		Bolt failed to remain open.		
		480-500	Firer worried by smoke.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATU
(Cont'd) EM-2 #5	20 rounds per minute. Semi-automatic.	520		Bolt failed to remain open.		
		560		Bolt failed to remain open.		
		600	Test completed.			
			Note: For the last 250 rounds smoke worried the firer but this was mainly due to the direction of the breeze.			
FN#11	20 rounds per minute. Semi-automatic.	50	Some smoke from around gas block. A slight breeze deifted this smoke directly into the firer's face.		Hand guard was considerably charred around the gas block, and front end of gas cylinder, particularly around the front retaining screw. The gun was still firing satisfactorily and was considered serviceable. It was considered that this rate of fire, 20 Rds. per minute, is too high and would result in damage to the guns. However, it could be maintained in an emergency, providing smoke did not interfer too much with the firer's aim.	
		85		Failed to eject.		
		110	Hand guard getting uncomfortably hot.			
		111		Failed to eject.		
		120	Hand guard too hot to hold and shoot accurately. Firer continued by holding sling between hand and hand guard and resting the rifle on sandbag rest. Smoke increasing and making aiming more difficult. The wind dropped and the smoke was drifting straight up around the fore sight.			
		160	Hand guard too hot to hold. Rifle rested on sandbags and firer steadied it by holding the sling.			
		240	Smoke increasing, from around gas block and along hand guard to half length of gas cylinder. Each round produced a large puff of smoke from around gas block. Aiming very difficult.			
		264		Failure to feed. Magazine spring jammed.		
		319		Failure to feed.		
		600	Test completed.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) FN #11			Note: For the last 300 rounds, smoke made aiming very difficult and shooting would necessarily be inaccurate.			
T-25 #34	60 rounds per minute for 5 minutes. Automatic	160	Some smoke issuing from full length of stock forward of the chamber.	Failure to feed	The stock was completely unserviceable, the forward end was badly burnt and the rear end was well charred. There was no other damage to the weapon.	110°
		181				
		200	Smoke increasing.			
		220	Smoke interfering with firer's aim.			
		240	Thick clouds of smoke make aiming difficult and accurate aiming impossible.			
		280	Forward end of stock burst into flames.			
			TEST ABANDONED			
1	60 rounds per minute for 5 minutes. Automatic.	160	Some smoke from full length of hand guard but insufficient to worry firer.	Failure to eject	The hand guard was slightly charred on the inside and a small piece of wood broke away from each side, from just beside the front retaining screw. Charring was quite severe at these points. It should be noted that this same gun fired the 600 rounds semi-automatic at 20 rounds per minute and the hand guard was not changed. Had the hand guard not been slightly charred from this previous firing, it is considered that the damage would have been very slight. As it was, the weapon was still serviceable.	
		193				
		260-300	Smoke and mirage from barrel had some slight affect on the firers aim but a slight cross-breeze prevented this from becoming serious.			
		300	Test complete.			
EM-2 #5	60 rounds per minute for 5 minutes. Automatic	120	Some smoke from rear end of gas cylinder		The barrel bearing in the front grip was charred, also the front end of the gas cylinder slot in the front grip was charred. The front	116°
		160	Trigger getting very hot. Considerable smoke from forward end of front grip.			

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
(Cont'd) EM-2 #5	60 rounds per minute for 5 minutes. Automatic	200	Trigger too hot to operate. Firer had to use glove. Rear end of body felt warm to firer's face.		grip screw was broken. The front sight screw was broken. This gun had previously fired the 600 rounds semi-automatic at 20 rounds per minute and the front grip had not been changed. Had the front grip not been charred from this previous firing it is considered that the damage in this respect would have been slight.	
		280	Considerable increase in smoke. A slight cross breeze prevented this from interfering with the firer's aim.			
		300	Test complete.			
T-25	40 rounds per minute for 5 minutes. Automatic	80	Some smoke from around operating slide.		Weapon completely serviceable. No visible damage.	95°
		120	Smoke increasing from around operating slide and some from forward end of stock.			
		160	Smoke still increasing, slight breeze drifting the smoke direct into firer's face causing some discomfort but did not interfere with aiming.			
		200	Test complete.			
#20	40 rounds per minute for 5 minutes. Automatic.	100	Some smoke from full length of hand guard. This did not worry firer.		Very slight charring of the hand guard around the gas block. Considered to be negligible. Weapon completely serviceable.	98°
		180	Smoke increasing, slight breeze drifting smoke direct into firer's face causing some discomfort but did not seriously interfere with aiming.			
		186		Failure to eject.		
		200	Test complete.			
EM-2 #5	40 rounds per minute for 5 minutes. Automatic.	120	Some smoke from around the full length of the gas cylinder.		Weapon completely serviceable. No visible damage.	106°
		136		Failure to feed. Bolt not fully closed (due to misplaced sear spring.)		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIENT TEMPERATURE
Cont'd) EM-2 #5	40 rounds per minute for 5 minutes. Automatic	160	Slight increase of smoke from around the gas cylinder, from forward end of front grip.			
		182		Holding open device operated with rounds in the magazine.		
		200	Test completed			
EM-2 #2	15 rounds per minute. Semi-automatic.	100	Front grip getting hot			98°
		110	Trigger getting uncomfortably hot.			
		130	Heat from body of gun felt on firer's cheek			
		140	Front grip uncomfortably hot. Trigger very hot.			
		160	Trigger to hot to operate. Glove had to be worn.			
		180	Some smoke from around gas cylinder. Cocking handle very hot.			
		200	Some smoke now coming from front-end of front grip.			
		220	Stock too hot to hold and shoot accurately without sandbag rest. Sling held between the hand and front grip.			
		240	Heat from trigger could be felt through canvas glove.			
		260		Failure to feed Bolt not fully home.	This stoppage was found to be due to the sear spring becoming out of position and frictioning on the inside of the receiver, so preventing the bolt from going forward. The gun had to be stripped to put this right.	
		264	Note: Test abandoned as time lost over this last stoppage would not allow the correct rate of fire to be maintained. Test recommenced when the gun was cool again.	Failure to feed Bolt would not go forward.		

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WEAPON	RATE OF FIRE	ROUNDS FIRED	CONDITION DURING FIRING	STOPPAGE AND MALFUNCTIONS	CONDITION ON COMPLETION OF TEST	AMBIEN TEMPERAT
EM-2 #2	15 rounds per minute. Semi-automatic	60	Front grip getting warm.			105° to
		80	Trigger getting warm.			
		100	Trigger getting hot			
		120	Trigger to hot to operate. Glove had to be worn.			
		140	Front grip uncomfortably hot.			
		170		Failure to feed bolt not fully home.		
		174		Failure to feed. Bolt remained to the rear and would not go forward.		
			Note: Test abandoned owing to time lost. To save time another gun was then used, rather than wait for this one to cool.		On stripping the gun a broken locking lever was found. This was probably the cause of the previous stoppage. Front grip screw broken.	
FN #11	15 rounds per minute. Semi-automatic	2		Broken extractor Spring caused failure to eject		
		70	Hand guard getting warm.			
		100	Hand guard getting hot.			
		110	Hand guard uncomfortably.			
		117		Broken extractor		
			Note: Test abandoned and recommenced when the gun had cooled. The time taken to fit the new extractor would not allow the correct rate of fire to be maintained.			

Test No. 13:

1. Purpose: To determine the comparative effectiveness of a rifle squad armed with the test rifles and as currently armed, when firing from a fixed position at 250 yards.

2. Method: (The purpose, and consequently the method, of Test No. 13 was altered by agreement between the UK and US representatives at AFF Board No. 3 because of practical difficulties: The test required more soldiers and ranges than were readily available; the date of the completion of the tests was moved forward and therefore time was limited, and finally the necessary number of squad instructors could not be provided).

a. One squad of nine men was selected from firers familiar with the test weapons and with the US standard squad weapons (the M-1 and BAR).

b. A linear target consisting of ten kneeling silhouette targets spaced five yards apart, representing an enemy squad, was established at a range of 250 yards.

c. A second target consisting of two kneeling silhouette targets, representing an enemy machine gun, was placed 75 yards to the left rear of the linear target.

d. A screen three feet high, extending the width of the linear target and two yards beyond each flank, was placed two feet behind the linear target and concealed by brush.

e. A similar screen was placed behind the machine gun target.

f. The squad fired the problem four times with each type test rifle--twice using automatic fire and twice using semi-automatic fire--and twice with US standard weapons (8 M-1's and one BAR). During the automatic firing two of the nine test rifles in each trial were equipped with bipods.

g. 220 rounds were issued to the squad for each firing.

h. The squad was instructed to fire as rapidly as effective fire could be placed on the targets but no time limit, as such, was specified.

i. The firing was conducted as follows:

(1) The squad adopted the prone position.

(2) The squad leader gave the necessary order to place fire on the linear target.

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(3) After approximately half of the ammunition allotted to the two test rifles equipped with bipods and to the BAR (when the squad was equipped with standard weapons) had been expended, the officer in charge caused the machine gun target to appear. The squad leader then gave the necessary order to shift the fire to the two test rifles (BAR when the squad was equipped with standard weapons) to the new target and to change them to automatic fire.

j. After each firing, hits on the silhouettes and screens were counted. Ricochets were counted as hits. However, for the purpose of rating of the rifles for effectiveness of fire, only hits on the screens were considered.

3. Results:

TOTAL HITS FOR TWO FIRINGS SEMI-AUTOMATIC
(Out of 440 Rounds)

Rifle	Linear Screen	M. G. Screen	Total Screens
T-25	283	24	307 (69.8%)
M-1(BAR)	224	61	285 (64.8%)
EM-2	255	21	276 (62.7%)
FN	227	44	271 (61.6%)

Figure No. 1

TOTAL HITS FOR TWO FIRINGS AUTOMATIC
(Out of 440 Rounds)

Rifle	Linear Screen	M. G. Screen	Total Screen
T-25	102	68	170 (38.6%)
EM-2	97	60	157 (35.7%)
FN	91	55	146 (33.2%)

Figure No. 2

4. Analysis:

a. In semi-automatic fire the T-25 squad (69.8% hits on screen) was the most effective and the FN (61.6% hits on screen) was the least effective.

b. The M-1 squad (64.8% hits on screen) was slightly more effective than the EM-2 squad (62.7% hits on screen).

c. In automatic fire there was no great difference between the 3 test rifles squads, the T-25 (38.6%) being slightly better than the EM-2

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(35.2%) and the FN (33.2%).

d. Under the conditions of the test, all rifle squads fired more effectively in semi-automatic than in automatic fire.

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Test No. 13-1/2:

1. Purpose: To determine the suitability of muzzle attachments for performing designed functions.

2. Method:

a. The method of attachment of each accessory to the rifle was tested for secureness and ease of attaching and detaching.

b. The performance of the rifle with each attachment was compared to the functioning of the rifle without attachment in Recoil, Stability and Balance.

c. The effect of attachments on accuracy and point of impact were determined from the results of Test 6, Phase V.

d. Attachments were tested to determine their suitability to perform the functions for which they were designed.

3. Results:

a. Secureness and ease of attaching and detaching:

(1) EM-2: The accessories available with this weapon were: Grenade Launcher and Bayonet.

(a) The Grenade Launcher is fitted by sliding it over the barrel until it meets the bayonet lugs. It is then rotated around the barrel until a spring catch is forced over the lugs securing it in position. This spring catch must be pressed before the launcher can be rotated and removed. It was secure and easy to fit and detach.

(b) The Bayonet is fitted by releasing a spring catch in the handle and rotating the upper half of the handle through 180°. This portion of the handle is fitted over the barrel until it meets the bayonet lugs. It is then rotated around the barrel until a further catch is forced over the lugs and secures the bayonet in position. It is steadied by a ring in the hilt fitting around the muzzle. It was secure and easy to fit and detach.

(2) FN: The accessories available with this weapon were: Grenade Launcher, Bayonet, Flash Hider, Stabilizer and combined Bayonet and Flash Hider.

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(a) The Grenade Launcher is fitted by sliding it over the barrel, and securing by means of a bracket which fits over the bayonet lugs on the barrel and is held in position by a screw and wing nut. The Grenade Launcher was secure and easy to fit and detach.

(b) The Bayonet has no handle. It is fitted by sliding the securing bracket over the barrel until it meets the bayonet lugs. On rotating the bayonet around the barrel a spring catch is forced over the lugs and holds it in position. The spring catch has to be pressed before the bayonet can be rotated and removed. It was secure and easy to fit and detach.

(c) The Flash Hider and the Stabilizer each screw on to the muzzle. They were secure and easy to fit and detach.

(d) The combined Bayonet and Flash Hider is fitted to the weapon in the same manner as the bayonet. It was secure and easy to attach and detach.

(3) T-25: The accessories available with this weapon were a Grenade Launcher and a Bayonet.

(a) The Grenade Launcher is fitted by sliding it over the stabilizer, and securing it to the bayonet stud (an integral part of the stabilizer) by a bracket with a spring detent. The Launcher was easy to attach but difficult to detach when hot and, when in position, was secure.

(b) The Bayonet is attached to the bayonet stud by means of two spring catches in the handle. It is steadied in position by a ring in the hilt which fits around the muzzle. The bayonet was easy to fit and to detach but, when in position, was not secure. The two spring catches which hold it in position are not sufficiently positive; a light blow would detach the bayonet.

b. Comparative performance with and without attachments:

(1) Recoil and Stability: Each weapon was fired with ball ammunition with its various attachments in place. The attachments had no apparent effect on the recoil or stability of the weapon, except the Stabilizer of the FN reduced the recoil.

(2) Balance: With the T-25 and EM-2 it was found that fitting the muzzle attachments had little effect on the balance when carried with a full magazine in position. The FN

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with a full magazine in position is butt heavy; when the muzzle attachments are added, the balance of the rifle is improved.

c. Suitability to perform designed functions.

(1) Grenade Launcher: With launchers attached, all weapons launched rifle grenades and were about equally suitable. (For details, see Test No. 17).

(2) Flash Hider: The Flash Hider of the FN considerably reduced the flash. (For details, see Test No. 18).

(3) Bayonets: When used for bayonet fighting, the bayonets of the EM-2 and FN rifles performed without malfunctions. In the case of the T-25, only two bayonets were provided and each of those broke across the handle close to the spring catches. (For details, see Test No. 14).

d. The effect of attachments on accuracy and point of impact. The effect is negligible except for the T-25 with bayonet and grenade launcher in which case the change in the center of impact is unacceptable. (For details, see Test 6, Phase V).

4. Analysis: All attachments, except the bayonet for the T-25, are suitable for performing the functions for which they were designed. However, the bayonet and grenade launcher for the T-25 caused an unacceptable change in the center of impact.

Test No. 14

1. Purpose: To determine the suitability of the tested rifles for bayonet fighting.

2. Method:

a. Test rifles and M-1 rifles were equipped with bayonets and loaded magazines.

b. The M-1 rifle was used as a control weapon for the test.

c. A bayonet course was laid out that was a combination of the old U. S. bayonet course with the addition of some obstacles proposed by the British. It required the use of all types of thrusts, parries, and butt strokes.

d. Eighteen men were selected to run the course. The men varied from recruits who had no previous bayonet training, to men with combat experience. One man was a bayonet instructor with the British School of Infantry.

e. Observations were made on the ease of affixing bayonets and the balance of the rifles after bayonets were fixed. Men were observed while running the course and questioned concerning the ease of delivering all types of strokes, thrusts, withdrawals and parries.

f. The course was run 62 times: 18 times with the M-1, 14 times with the T-25, 15 times with the EM-2 and 15 times with the FN. It was planned to have each man run the course twice with each type of rifle; however, the test was discontinued after the course was run 62 times due to excessive breakages of the test rifles.

3. Results:

a. No difficulty was encountered in fixing bayonets on any rifle, and all rifles were equally suitable in this respect.

b. No bayonets came off any of the rifles during the test.

c. All rifles were equally easy to handle in bayonet fighting, except that difficulty was encountered in delivering the horizontal butt stroke with the EM-2 because of the location of the magazine.

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d. The following breakages and malfunctions occurred: (Inclosure #1)

M-1 - None

T-25 - 1 broken stock; 2 broken bayonets.

EM-2 - Butt plate released once; magazines were released 4 times; two butt catches bent. (Note: Magazines were released due to right hand slipping forward on the thrust and striking magazine release.)

FN - 2 stocks were cracked; 1 stock broken completely off rifle.

4. Analysis:

a. The test rifles are suitable for bayonet fighting with respect to ease of handling. The EM-2 is slightly less desirable than the other rifles because of the location of the magazine.

b. All test rifles in their present form are unsuitable for bayonet fighting due to lack of durability.

c. None of the test rifles were comparable to the M-1 in durability for bayonet fighting. (App. F-1, F-15, F-16, F-17)

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BAYONET COURSE RECORD

Name	EM-2 (Note 5)	FN	T-25	M-1
Thwaites*	x	x	x (Note 1)	
Roberts	x		x	x
Paille	x	x		x
Foxworth*	x			
Coulas*		x		
White	x	x		x
McCoy	x	x	x	x
Cattral		x	x(Note 2)	x
Degan	x	x	x	x
Paradis	x	x	x	x
Dixie	x	x		xx
Moffatt	x	x(Note 3)		x
Wilson	x	x	x(Note 2)	
Davis	x	x	x	x
Holland	x	x	x	x
McMinamen			x	xx
Cook	x(Note 4)	x(Note 3)	x	x
Christian	x	x(Note 3)	x	x

Note 1 - Stock of T-25 broken on horizontal butt stroke.
Note 2 - Bayonet of T-25 broken in shell hole thrust.
Note 3 - FN stock cracked or broken on horizontal butt stroke.
Note 4 - EM-2 butt released - working parts fell out of back.
Note 5 - Magazine dropped from EM-2 four times on thrust
*Indicates individuals with combat experience.

Inclosure No. 1, T-14

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Test No. 15:

1. Purpose: To determine the facility and ease with which currently accepted firing positions can be assumed by men of varied conformations, including left-handed men.

2. Method:

a. The U. S. rifle M-1 was used as the control item.

b. During all tests firers were watched and, from time to time, questioned as to the ease of assuming firing positions with each of the test rifles.

c. Seven men of reasonably varied conformations were tested in each standard firing position with each rifle:

Name	Height	Weight	Description
Tucker	6' 4"	170 lbs	Long limbed
Roberts	6' 2"	212 lbs	Heavy set
Lovett	5' 7"	200 lbs	Fat & Short armed
Cattral	5' 10"	175 lbs	Average build
Wilson	5' 8"	160 lbs	Average build
White	5' 4"	140 lbs	Short limbed
Marshall	5' 7"	148 lbs	Left-handed - Average build

Figure No. 1

3. Results:

a. Semi-automatic Fire: Positions as described in British manual, Infantry Training, Volume I, and U. S. FM 23-5 were used without modification. Difficulties encountered were:

(1) M-1: No difficulty was experienced in any position

(2) EM-2: No difficulty was experienced in any position.

(3) FN: Taller men had some difficulty in all positions in getting their eye in line with the sights.

(4) T-25:

(a) The magazine interfered with placing the elbow under the weapon in all firing positions.

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(b) The fingers of the left hand of all firers came in contack with the operating rod. This was a minor difficulty.

(5) None of the above difficulties prevented the firers taking acceptable firing positions with all of the rifles.

b. Automatic Fire (without rest): The same prone position used in semi-automatic firing was used without difficulties other than as listed in paragraph a, above. With all rifles, in the standing and kneeling positions, an exaggerated forward lean was found desirable in order to compensate for recoil. (For photographs of firing positions, see Appendix F - 9)

c. Automatic Fire (with bipod): The standard British position for the Bren gun was preferred by all firers. (For photographs of firing positions, see Appendix F - 10).

d. The Left-handed man had no difficulty in assuming all firing positions with all the rifles. However, the FN was the easiest for him to operate because the rifle is designed for left-handed operation; and he could not fire the EM-2 at all because the ejection way coincided with his cheek rest.

4. Analysis:

a. Using the various test weapons and the M-1 rifle, it was possible for men of reasonably varied conformations to assume all firing positions without major difficulties and with somewhat nearly equal ease for all of the weapons.

b. Tall men had some difficulty with the FN in getting their eye in line with the sight; the location of the magazine on the T-25 interfered slightly with the firer's placing his elbow under the rifle; and the EM-2 could not be fired from the left shoulder. (Appendix F-18)

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Test No. 16:

1. Purpose: To determine the dependability and adequacy of the safety devices of the test rifles.

2. Method:

a. Safety devices were examined and their functioning noted.

b. During the conduct of all tests, safety devices of the rifles were used normally. Difficulties of operation and failures of the safety devices to operate correctly were noted.

3. Results:

a. Description of Safety Devices:

(1) T-25 Rifle:

(a) Applied Safety: The applied safety is of the cross-bolt type, operating on the rear of the trigger by means of a small push-through type catch.

(b) Integral Safety Features:

1. On firing the gun, in the event that bolt closure is incomplete, the hammer cannot be released by a pull on the trigger. The hammer lock prevents the hammer from rotating upward unless the action is locked.

2. Release of the trigger and grasping the operating slide handle for manual assistance in closing the breech automatically results in the sear engaging the hammer.

3. The front and rear firing pins are not aligned until the bolt is closed.

(2) EM-2 Rifle:

(a) Applied Safety: Applied safety consists of a safety bar operated by a safety lever located in the forward end of the trigger guard. It is moved to the rear to prevent the sear from disengaging the firing pin.

(b) Integral Safety Feature: On firing the gun, the firing pin cannot be pushed forward to contact the primer of the chambered round until the firing pin

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sleeve has first moved forward and forced the two locking levers into the locked position.

(3) FN Rifle:

(a) Applied Safety: The applied safety is incorporated in the selector or change lever. When this is moved fully to the rear, the trigger is locked.

(b) Integral Safety Features:

1. On firing the gun, in the event that closure of the bolt is incomplete, the hammer cannot be released by a pull of the trigger. The hammer check locks the hammer in the cocked position until the bolt is closed and the bolt slide has moved fully forward.

2. The firing pin cannot be contacted by the hammer unless the action is closed.

b. Dependability: During the conduct of all tests, the following points were noted:

(1) Applied Safety:

(a) T-25 Rifle: Functioned correctly throughout.

(b) EM-2 Rifle: After a number of rounds had been fired and the safety lever had been operated a considerable number of times, there was a tendency for the safety lever to be moved to the "on" position by the vibration of the gun. This occurred on each of four rifles until the spring positioning the safety lever had been changed.

(c) FN Rifle: No malfunctions of the safety lever were observed. However, the safety lever could not be operated readily on some of the rifles because of stiffness in the movement.

(2) Integral Safety Features: Throughout the tests there were no malfunctions of the integral safety features of any of the test weapons.

c. From observation throughout the test it was determined that the safety devices were adequate.

4. Analysis: With respect to dependability and adequacy of the safety features of the test rifles, all three are satisfactory and about equal, except that the applied safety feature of the EM-2 requires very minor modification.

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Test No. 17:

1. Purpose: To determine the suitability of the test rifles for launching grenades, and adaptability for launching rifle grenades from currently accepted firing positions.

2. Method:

a. The U. S. Rifle M-1, with launcher and sight, was used as a control item.

b. The grenade used was the M11A2 practice grenade with the appropriate cartridge.

c. The test was carried out in two parts:

(1) Accuracy:

(a) Firing was conducted from a machine gun tripod with a gun rest mounted on the cradle. The gun rest was equipped with a spring shock absorber and rubber pad.

(b) The ranges fired were 100 yards, 150 yards (See Para.e), and maximum range. Four groups of five rounds each were fired with each rifle at each range.

(c) The target at 100 yards was a 12' x 16' vertical panel. At 150 yards the target was an 18' x 20' panel.

(d) Mean radius, maximum vertical and horizontal dispersion and maximum spread were computed at 100 and 150 yards. At maximum range the impact pattern was measured on the ground and the mean radius and maximum spread were computed.

(e) An attempt was made to test the accuracy of all rifles at 200 yards but, due to the steep angle of fall of the grenades at this range, insufficient shots could be intercepted on a vertical target to determine the pattern. The range was therefore decreased to 150 yards.

(2) Firing Positions:

(a) Five men fired two grenades each from the kneeling, standing and prone positions.

(b) Firing was observed and the firers were questioned as to the adapability of the test weapons for firing positions.

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3. Results:

a. ACCURACY
(Measurements in Feet)

Weapon	100 Yards				150 Yards				Maximum Range			
	MR	MH	MV	MS	MR	MH	MV	MS	Range	Elev.	MR	MS
EM-2	2.7	5.8	5.5	8.1	4.9	9.2	10.3	13.0	623	40°	41	100
FN	2.6	4.1	5.8	7.3	6.0	11.8	11.2	15.2	728	35°	34	95
M-1	2.6	4.1	4.1	6.9	5.8	10.7	13.0	14.3	774	40°	29	107
T-25	2.6	5.5	6.1	7.7	5.7	10.9	12.4	15.7	809	40°	21	59

Figure No. 1

b. Firing Positions:

(1) In the prone position difficulty was encountered in sighting the test rifles at low elevations because of the pistol grip and magazine underneath the stock.

(2) A sight over the top of the rifle, as provided with EM-2 and FN was preferred by all firers to the sight on the side as provided with the M-1 rifle. No sight was provided with the T-25. (For the purposes of the test, elevation was determined with a clinometer).

(3) All but the tallest firers had difficulty sighting over the top of the FN sight in the standing and kneeling positions.

(4) Firers found currently accepted firing positions to be adequate and satisfactory with all rifles.

c. No damage was incurred by any of the rifles when fired from currently accepted firing positions.

d. Firers reported the severity of the kick in the following order: EM-2 -least, followed by FN, T-25 and M-1.

4. Analysis:

a. All test rifles are suitable for launching grenades and adaptable to launching grenades from currently accepted firing positions.

b. While differing in various respects, in the overall the test rifles and the M-1 are about equally acceptable.

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Test No. 17½:

1. Purpose: To determine if the test rifles are strong enough to withstand the hard usage of field service.

2. Method:

a. The M-1 rifle was used as a control item.

b. Ten soldiers were formed into a test team armed as follows: Two T-25s (sights up), two T-25s (sights down), two EM-2s, two FNs and two M-1s.

c. The test team carried out each of the operations described below 10 times, once through the 17 operations being considered a single cycle. Rifles were check fired for zero and stoppages at the end of each cycle.

(1) Walk through heavy underbrush consisting of blackberry vines, grape vines, bamboo briars and alder bushes for a distance of fifty yards. Rifles were carried at the ready.

(2) Crawl through heavy brush consisting of grape vines, bamboo briars and alder bushes for fifty yards. Twenty-five yards were traversed with the rifle cradled in the arms in front of the body and the remaining twenty-five yards with the rifle pulled along on right side of soldier.

(3) Crawl fifty yards through heavy Johnson grass. For twenty-five yards the rifle was cradled in the arms in front of the body and for the remaining twenty-five yards it was pulled along on the right side of the firer.

(4) Scale a twenty foot ladder, go over the top of the ladder and come down the other side. The rifle was carried slung over the shoulder.

(5) Scale a six foot log wall with the rifle carried at the balance in one hand.

(6) Climb through a window 4' 6" above the ground. The rifle was pushed through window and dropped on the floor. The soldier followed.

(7) Climb out of window to the ground carrying the rifle at the balance.

(8) Crawl across a ditch 20' wide by 10' deep and return. On one trip the rifle was cradled across the arms in front of the body; on the return trip the rifles were pulled along at the right of the soldier.

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(9) Crawl fifty yards through road dust. For twenty-five yards rifle was cradled across the arms in front of soldier, and for the remaining twenty-five yards pulled along at his right side.

(10) Run forward ten yards, hit the ground, break the fall with the butt of the rifle, and assume firing position. This operation was repeated three times without pause.

(11) Submerge the rifles in one foot of clear running water in a sandy bottomed stream for one minute.

(12) Load into a 2½ ton truck as quickly as possible with rifles held at the balance. This operation was repeated with rifles slung.

(13) Unload from a 2½ ton truck as quickly as possible with rifles held at the balance.

(14) March across rough terrain and through heavy brush. Rifles were carried slung.

(15) Climb and descend a steep sand bank. The rifles were used to assist in climbing and in descending.

(16) Stack rifles against a wall and then knock them onto the floor.

(17) Pile rifles into the bed of a 2½ ton truck which is then driven across rough terrain for one mile as fast as possible.

3. Results:

a. Other breakages incurred in tests can be found in Test No. 34 (Malfunctions and replacement of parts) and Test No. 14 (suitability for bayonet fighting).

b. In traversing the obstacles listed in paragraph 2c, above, the following malfunctions were reported:

(1) WALK THROUGH HEAVY UNDERBRUSH

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Front sight caught in brush	2
	Brush caught between trigger guard and pistol grip	1
	Bayonet stud caught in brush	1
	Rear sight knocked down	2
	Rear sight caught in brush	1

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(1) WALK THROUGH HEAVY UNDERBRUSH (Cont'd)

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights down	Vines and leaves caught under front sight	2
FN	Hard to carry at high port (Not reported in Bayonet Test)	1
EM-2	Safety lever moved from safe to unsafe	1
	Vines caught between sight and barrel	1
	Brush caught in pistol grip	1
M-1	None	

Figure No. 1

(2) CRAWL THROUGH UNDERBRUSH

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Back sight knocked partially down	3
	Front sight caught in brush	1
	Front sight knocked down	2
	Bayonet stud and other projections caught in brush	4
	Sand in stabilizer	1
T-25 Sights down	Front sight pulled up	1
	Magazine fell out	1
	Bayonet stud and other projections caught in brush	6
	Brush caught between trigger guard and pistol grip	2
FN	Sand in breech	1
	Brush caught in magazine and trigger guard	3
	Sights knocked to zero	1
EM-2	Magazine fell out	2
	Brush caught between sight and barrel	2
	Other projections caught in brush	2
	Leaf got under sight cover obscuring sight	1
M-1	Projections caught on vines	1

Figure No. 2

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(3) CRAWLING THROUGH HIGH GRASS

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Front sight knocked down	2
	Rear sight knocked down	3
	Projection caught in grass	1
T-25 Sights down	Projections caught in grass	4
	Muzzle and butt caught in grass (rifle across forearm)	2
FN	Projections caught in grass	3
	Sight set screw worked loose	1
	Sight setting changed	1
EM-2	Grass caught in projections	3
	Safety lever moved from safe to unsafe	4
	Sight caught in grass	1
	Magazine fell out	1
M-1	Grass caught on projections	3
	Muzzle plugged with sand	1

Figure No. 3

(4) LADDER CLIMB:

No incidents.

(5) 6 FOOT WALL CLIMB:

No incidents

(6) CLIMB IN THROUGH WINDOW

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Magazine fell out	1
	Sights knocked partly down	1
EM-2	Sight cover knocked back $\frac{1}{2}$ inch	1
	No other incidents with other rifles	

Figure No. 4

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(7) CLIMB OUT OF WINDOW

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Rear sight knocked down	1
	No incidents with other rifles	

Figure No. 5

(8) CRAWLING IN AND OUT OF DITCH

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Rear sight knocked down	3
	Front sight partially knocked down	1
EM-2	Safety lever moved from safe to fire	1
	No incidents with other rifles	

Figure No. 6

(9) CRAWLING THROUGH ROAD DUST

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Front sight knocked down	1
	Magazine stuck in rifle	1
T-25 Sights down	Magazine stuck in rifle	1
	Muzzle and operating rod recess filled with sand	1
	Sand in receiver	1
FN	Sand between deflector and bolt	1
	Sand in muzzle	1
	Sand in chamber	3
	Cocking lever difficult to operate	1
EM-2	Safety moved from safe to fire	3
	Change lever moved from SA to Automatic	1
M-1	Sand in operating rod recess	1
	Safety lever hard to operate and then broke under pressure	1

Figure No. 7

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(10) RUN 10 YARDS - HIT GROUND, ASSUME FIRING POSITION

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Bolt opened 1 inch and closed	1
	Hump on top of stock hurt hand	1
T-25 Sights down	Bolt opened 3/4 inch and closed	1
	Bolt opened 1 inch and stuck open	1
FN	Bolt opened 1 inch and closed	1
	Bolt opened 2 inches and closed	1
EM-2	Safety lever moved from safe to fire	1
	Bolt opened 2 inches and closed	1
	Magazine fell out	1
	Rubber butt pad came off	1
M-1	None	

Figure No. 8

(11) SUBMERGED IN 1 FOOT OF WATER

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Sand in magazine	2
	Bolt hard to open	2
	Magazine hard to remove	2
T-25 Sights down	Bolt hard to open	2
	Bolt could not be opened by hand	2
	Magazine stuck	1
FN	Bolt hard to open	1
EM-2	Bolt hard to open	1
	Safety lever moved from safe to fire	1
	Sand in operating mechanism	2
M-1	Sand in operating rod recess	2
	Bolt hard to open	2

Figure No. 9

(12) LOAD INTO TRUCK:

No incidents.

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(13) UNLOAD FROM TRUCK:

No incidents.

(14) RIFLES STACKED AND KNOCKED TO FLOOR

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Safety moved from safe to fire	1
FN	Rear end of change lever broken	1
	Deflector on bolt cover bent and torn	1
	No breakages were noted with other weapons	

Figure No. 10

(15) ONE MILE MARCH OVER ROUGH TERRAIN (RIFLES SLUNG)

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
T-25 Sights up	Bayonet stud caught in brush	1
	Both ends of rifle caught in brush	1
T-25 Sights down	Bayonet stud caught in brush	3
	Front end of rifle caught in brush	1
	Front sight caught in brush	1
FN	None	
EM-2	Safety lever moved from safe to fire	1
M-1	Brush caught in stacking swivel	1
	Muzzle caught in brush	1

Figure No. 11

(16) RIFLES PILED ON FLOOR OF TRUCK

Rifle	INCIDENTS	NO. OF TIMES OCCURRED
FN	Sight setting changed to zero	1
	No incidents with other rifles	

Figure No. 12

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(17) CLIMBING UP AND DOWN STEEP BANK:

No incidents.

c. (1) No malfunctions occurred with any rifle in zeroing before each cycle.

(2) Upon completion of each cycle, rifles were fired without cleaning to check zero and the following malfunctions were noted. In general the malfunctions appeared to be attributable to dirt and water.

FAILURE TO FIRE AFTER HARD USAGE
(Each Rifle Fired 100 Times SA only)

Rifle	MALFUNCTIONS	INCIDENCE PER RIFLE PER 100 TIMES
T-25	Failure to feed, over-ride Failure to extract Operating rod had to be operated by hand	14.7
FN	Failure to feed, over-ride Failure to extract. Operating rod had to be operated by hand	17.0
EM-2	Failure to fire, light strike Failure to feed, over-ride Failure to extract Hard trigger pull	6.5
M-1	Failure to feed, over-ride	3.0

Figure No. 13

d. Although the sight setting in some cases moved during a cycle in no case was there a change in zero.

4. Analysis:

a. The rifle which impeded the progress of the soldier the least during movement through heavy brush, grass and across rough terrain was the M-1 followed in order by the FN, EM-2 and T-25. For every incident with the M-1 there were 1.5 incidents with the FN, 3 with the EM-2 and 8 with the T-25.

b. In ability to withstand hard usage under conditions of this test, only minor damage was incurred. Test No. 14, however, finds the rifles unacceptable in durability for bayonet fighting.

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c. In ability to fire immediately after hard usage (as distinguished from damage) all three test rifles are inferior to the M-1. The EM-2 approaches the M-1 most closely and is considerably superior to the other two. In this respect the EM-2 is of marginal acceptability and the FN and T-25 are unacceptable. (Appendix F-19, F-20, F-21)

Test No. 18:

1. Purpose: To determine the comparative visibility of the muzzle flash of the test rifles during darkness and of the smoke during daylight.

2. Method:

a. The test was carried out in two phases.

(1) Phase I - For Smoke During Daylight.

(2) Phase II - For Flash by Night.

b. For Phase I observers reported whether or not they saw any smoke when the rifles were fired, and if so, its color, size and density.

c. For Phase II observers reported whether or not they saw any flash when the rifles were fired, and if so, its color, brilliance and size.

d. The U. S. Rifle M-1 was used as a control weapon.

e. Observers were placed on the flank at right angles to the line of fire at distances of 100, 200, and 300 yards from the rifle, and to the front at an angle of 5° to the line of fire at ranges of 100, 200, 300, 500, 800 and 1000 yards. (See Figure 3).

f. Five rounds were fired from each rifle at two second intervals between each shot. The observer at each range reported what he had seen after each rifle had fired.

g. Ten rounds were fired automatically in two and three round bursts and reported, followed by ten rounds in one burst and by twenty rounds in one burst which were also reported.

h. All firing was from a machine rest.

i. Cool barrels were used for Phase I and hot and cool barrels for the semi-automatic portion of Phase II.

3. Results:

a. Distance at which smoke was observed:

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(Continued)

a.

SMOKE
(Distance in Yards)

Rifle	Distance at Which Seen FLANK	FRONT	Remarks
M-1	300	200	
T-25 Semi-auto.	300	200	
T-25 Automatic	300	800	
EM-2 Semi-auto.	200	200	
EM-2 Automatic	200	200	Smoke from 1-burst seen at 300 to front.
FN Semi-auto.	300	200	Smoke from 1-round seen at 300 to front.
FN Automatic	300	200	Smoke from 1-burst seen at 300 to front.

Figure No. 1.

b. Smoke Characteristics: (For details, see Encl.1) The size, color and density of smoke from the test weapons was described by the observers as follows:

(1) M-1 Rifle (Semi-automatic): Small, thin grey/white puffs.

(2) T-25 Rifle: Ranging from very small thin grey puffs when fired semi-automatic to large thick black cloud when fired 20 rounds automatic.

(3) EM-2 and FN Rifles: Ranging from very small very thin grey puffs when fired semi-automatic to large thick white cloud when viewed from the flank and medium large sized thin grey cloud viewed from the front when fired 20 rds. automatic.

c. Distances at which Flash could be observed:

FLASH
(Distance in Yards)

Rifle		Distance at Which Seen FLANK	FRONT	Remarks
M-1		300	300	Flash of 1-round seen 500 to front.
T-25 Semi-auto.	Cold	300	500	Flash of 1-round seen 800 to front.
	Hot	200	800	Beyond 200 one first round seen.
Automatic		300	1000	
EM-2 Semi-auto.	Cold	---	---	Nothing seen.
	Hot	100	---	Sparks only seen on flank.
Automatic		100	100	Sparks only seen on flank.
FN w/out Flash Hider Semi-auto.	Cold	300	500	One round seen at 1000.
	Hot	300	1000	First round only seen in each case.
w/out Flash Hider Automatic		300	1000	
With Flash Hider Semi-auto.	Cold	100	100	With hot barrel one round seen at
	Hot	100	100	200 and one at 300.
With Flash Hider Automatic		300	1000	

Figure No. 2.

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d. Flash Characteristics: (For details, see Incl. 2) The size, color and brilliance of the flash from the test rifles was described by the observers, as follows:

(1) M-1 Rifle (Semi-automatic): From the flank as very dull yellow pinpoint flashes and from the front as very small very dull orange flashes.

(2) T-25 Rifle:

(a) Cold barrel, semi-automatic, from the flank - small dull white flashes; from the front - small or pinpoint flashe with color varying from white and yellow to dull red.

(b) Hot barrel, semi-automatic, from the flank - very small very dull orange flashes; and from the front - very dull orange flashes of medium brilliance to small dull yellow flashes.

(c) Automatic: From flank - a bright orange or yellow flash of medium brilliance. From the front - varying from smal dull yellow flashes to bright yellow flashes of medium size.

(3) EM-2 Rifle:

(a) Semi-automatic: Cold barrel - Nothing observed either to the flank or from the front.

(b) Hot Barrel: To a flank at 100 yards - only very small dull red flashes; and from the front - nothing was observed.

(c) Automatic: With bursts up to 10 rounds - sparks only were visible to a flank. With 20 rounds - very small very dull red flashes were visible up to 100 yards. From the front - small dull orange flashes.

(4) FN Rifle (Without Flash Hider):

(a) Cold Barrel - Semi-automatic: To the flank - small dull yellow flashes. From the front - small white flashes of medium brilliance.

(b) Hot Barrel: Both to the flanks and from the front - small dull orange flashes.

(c) Automatic: To a flank - varying from medium-sized dull orange flashes to small dull orange flashes. From the front - varying from small dull yellow flashes to pinpoint flashes of undetermined color.

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(5) FN Rifle (With Flash Hider):

(a) Semi-automatic - Cold Barrel: Sparks only were visible to a flank. From the front - pinpoint flashes of undetermined color at 100 yards only.

(b) Hot Barrel: From a flank - very small dull orange flashes at 100 yards only. From the front - small dull orange flashes at 100 yards only.

(c) Automatic: To a flank sparks only were visible. From the front - varying from very small dull yellow flashes to very small very dull orange or yellow flashes.

4. Analysis:

In the suppression of smoke and flash the EM-2 using .280 caliber test ammunition is acceptable. The T-25 using the .30 caliber test ammunition is not acceptable. The FN using the .280 caliber test ammunition is acceptable in the suppression of smoke, but unacceptable in the suppression of flash.

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SMOKE TEST RESULTS

Weapon and Ammunition	Results
1. EM-2 Rifle, Cal. .280 Ball	
a. 5 Rounds Semi-automatic	Visible to a flank up to 300 yards and reported at this range as small thin white or grey puffs. Forward - Visible up to 200 yards and reported at this range as small very thin puffs. Not visible beyond 200 yards.
b. 10 Rounds in 2/3 Round Bursts Automatic	Visible to a flank up to 300 yards and reported at this range as a small thin white could. Forward - Visible to all observers up to 200 yards. Reported at this range as a medium sized greyish-white cloud of medium density. One observer at 300 yards reported seeing the 2nd series fired as a small faint blue cloud. Nothing observed beyond 300 yards.
c. 10 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a large thick yellow cloud. No observers beyond 300 yards. Forward - Visible to all observers up to 200 yards and reported at this range as a medium/large size, very thin could greyish in color. Nothing observed beyond 200 yards.
d. 20 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a large thick white cloud. No observers beyond 300 yards. Forward - Visible to all observers up to 200 yards and reported at this range as a medium/large thin grey could. Nothing observed beyond 200 yards.
2. FN Rifle, Cal. .280 Ball	
a. 5 Rounds Semi-automatic	Visible to a flank up to 300 yards. Reported at this range as very small very thin grey puffs. Forward - Visible to all observers up to 200 yards and reported at this range as very small thin grey puffs. One observer at 300 yards reported seeing one round only of the 1st series as a small blue puff. Nothing reported visible beyond this range.
	Weather condition throughout test - warm bright day with a very slight breeze.

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Weapon and Ammunition	Results
b. 10 Rounds in 2/3 Round Bursts Automatic	Visible to a flank up to 300 yards. Reported at this range as small thin white puffs. Forward - Visible to all observers up to 200 yards and reported at this range as medium sized thin white puffs. One observer at 300 yards reported one burst visible in the 1st series only, as a small blue puff. Nothing reported visible beyond this range.
c. 10 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a medium sized thin white cloud. Forward - Visible to all observers up to 200 yards and reported at this range as a medium sized grey could of medium density. One observer at 300 yards reported the 2nd series only as visible as a very small very thin white could. Nothing reported visible beyond this range.
d. 20 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a large thick white cloud. Forward - Visible to all observers up to 200 yards where it was reported as a medium-large sized thin grey could. Nothing reported visible beyond this range.
3. M-1 Rifle Cal. .30 M-2 Ball	
a. 5 Rounds Semi-automatic	Each round was visible from a flank up to 300 yards. At this range observers reported small, thin grey/white puffs. No observers beyond 300 yards. Forward - Visible to all observers up to 200 yards. At this range reported as small thin grey puffs. Not visible beyond 200 yards.

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Weapon and Ammunition	Results
4. T-25 Rifle Cal. .30 T-106	Visible to a flank up to 300 yards. At this range observers reported very small thin grey puffs. Forward - Visible to observers up to 200 yards. At this range reported as small very thin grey puffs. Nothing reported visible beyond 200 yards.
a. 5 Rounds Semi-automatic	
b. 10 Rounds in 2/3 Round Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a large thick grey/black cloud. No flank observers were posted beyond 300 yards. Forward - Clearly visible to observers up to 300 yards and reported at this range as a medium/large grey could of medium density. Observers at 1000 yards reported nothing visible at thiat range, but observers at 500 yards and 800 yards reported the second series visible as medium/small then grey could. Not visible at 1000 yards. No observers posted at 900 yards.
c. 10 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported as a large thick yellow cloud. Forward - Clearly visible up to 800 yards and reported at this range as a medium sized grey cloud of medium density. Not visible at 1000 yards.
d. 20 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards and reported at this range as a large thick black cloud. Forward - Clearly visible up to 800 yards and reported at this range as a medium sized grey cloud of medium density. Not visible at 1000 yards.

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FLASH TEST RESULTS

Weapon and Ammunition	Results
	Cold Barrel
1. EM-2 Rifle, Cal. .280 Ball	Nothing observed either to a flank up to 300 yards or forward.
a. 5 Rounds Semi-automatic	At the firing point a considerable number of sparks were observed.
	Hot Barrel
	At 100 yards to a flank sparks only were observed from the first 2 rounds fired. The remaining 3 rounds were reported as giving very small very dull red flashes. Nothing was reported visible beyond this range. At the firing point the flashes appeared to be more orange in color and slightly larger than those from the cold barrel.
b. 10 Rounds in 2/3 Round Bursts Automatic.	No flashes were visible to a flank at 100 yards or beyond but some sparks were reported as visible at 100 yards. Forward - One observer reported two bursts only as being visible at 100 yards, as very small dull orange flashes. Some sparks. Nothing observed beyond this range. General. At the firing point the flashes were observed to be more dull red than orange and were quite small.
c. 10 Rounds in 1 Burst Automatic	No flashes were visible to a flank at 100 yards or beyond. Some sparks were reported as visible at 100 yards. Noting was reported visible to the forward observers. General. At the firing point the flashes were dull red in color and appeared to be larger than those produced by the 2/3 round bursts.
d. 20 Rounds in 1 Burst Automatic	Visible to a flank at 100 yards and reported at this range as a very small very dull red flash. Nothing was reported visible beyond 100 yards. Forward - Reported visible at 100 yards as a very small dull orange flash. Nothing reported visible beyond this range. General. At the firing point the flash appeared more orange in color than the previous ones. It is characteristic of the flash from this weapon, that it forms about 3 inches forward of the muzzle with a very small flash at the muzzle itself.

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Weapon and Ammunition	Results
2. FN Rifle, Cal. .280 Ball with Flash Hider	
a. 5 Rounds Semi-automatic	Cold Barrel No flash visible to a flank. Sparks were observed from three rounds. Forward - At 100 yards the observer reported pinpoint flashes of indeterminate color from 3 rounds only. These may have been sparks as reported by the flank observer. Nothing was reported visible beyond 100 yards. At the firing point the flashes were observed to be very small, very dull and dull red in color. Many sparks were also seen. Hot Barrel Visible to a flank at 100 yards and reported as small dull orange flashes. Nothing was reported visible beyond 100 yards. Forward - All rounds were visible at 100 yards and were reported as small dull orange flashes with the first round brighter than the remainder. At 200 yards and 300 yards the 4th round only was observed, and was reported at 300 yards as a very dull, red pinpoint flash. At the firing point the flashes were observed to be orange, dull and about 5" long and 3" wide at the widest point. General Note. It may be noted that when the flash, throughout the test, is reported as red or dull red in color it is visible for only a short distance regardless of the size of the flash. Where it is reported as orange, yellow or white it is, generally speaking, visible at longer ranges.
b. 2/3 Round Bursts Automatic	The third burst only was clearly visible to a flank up to 300 yards. Forward - The third burst only was visible up to 1000 yards. It was reported at this range to be a very small, dull yellow flash. At the firing point the third burst was very noticeably brighter than the remainder. It was bright and white, the remaining flashes were orange or yellow. This bright flash had the appearance of a secondary flash.

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Weapon and Ammunition	Results
c. 10 Rounds in 1 Burst Automatic	Observers to a flank reported only sparks and these were visible up to 300 yards. Forward - Sparks only were reported visible at 100 yards. At 200 yards the flash was reported as being medium sized, orange in color and very dull, with sparks appearing through the flash. Nothing was reported visible beyond 200 yards. At the firing point the flash was observed to be very small, dull, and dull red in color.
d. 20 Rounds in 1 Burst Automatic	Observers to a flank reported sparks only and these were visible up to 100 yards only. Forward - At 100 yards sparks only were reported visible at 200 yards and 300 yards, the flash was reported as very small, very dull and orange or yellow in color with some sparks visible at 200 yards only. Nothing was reported visible beyond 300 yards. At the firing point the flash was observed to be very small, very dull and dull red in color.
3. FN Rifle, Cal. .280 Ball without Flash Hider	
a. 5 Rounds Semi-automatic	Cold Barrel Visible to a flank up to 300 yards. Reported at this range as small dull yellow flashes. Forward - All rounds visible to observers at 100 yards and reported as small dull yellow flashes. At 200 yards, 300 yards, 500 yards, and 800 yards two rounds only were observed. At 800 yards they were reported as small white flashes of medium brilliance. At 1000 yards one round only was observed as a small bright white flash. General. At the shorter ranges the flashes were reported orange or yellow in color but at the longer ranges they were reported as white. Hot Barrel Visible to a flank at 100 yards, the first round as bright white flash, the remainder as small dull orange flashes. At 200 yards and 300 yards the first round only was observed. Forward. Visible at 100 yards, the first round as a bright white flash and the remainder as small dull orange flashes. The first round was visible to all observers up to 1000 yards and was reported as a bright white flash of medium size.

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Weapon and Ammunition	Results
b. 2/3 Round Bursts Automatic	Clearly visible to a flank up to 300 yards as reported at this range as a series of medium sized dull orange flashes. Forward - Visible to all observers up to 500 yards where it was reported as a series of very small yellow flashes of medium brilliance. At 800 yards and 1000 yards two bursts only were observed and reported as small dull yellow flashes. General. At the shorter ranges the color was reported as orange and at the longer ranges as yellow.
c. 10 Rounds in 1 Burst Automatic	Visible to a flank up to 300 yards and reported at this range as a very small dull orange flash. Forward - Visible up to 1000 yards where it was reported as a small dull white flash. At the firing point the flash was very bright white in color and about 4 inches long and 2 inches diameter.
d. 20 Rounds in 1 Burst Automatic	Clearly visible to a flank up to 300 yards where it was reported as a small dull orange flash. Forward - Visible up to 1000 yards but at 800 yards and 1000 yards was reported as a pinpoint flash of indeterminate color. At 500 yards it was reported as a very small dull orange flash. At the firing poing the flash was very bright, white in color, about 6 inches long and 2 inches in diameter.
4. M-1 Rifle, Cal. .30	Visible to a flank up to 300 yards. Reported at this range as very dull yellow pinpoint flashes. No observers were posted beyond 300 yards. Forward - Visible to all observers up to 300 yards and reported at this range as very small very dull orange flashes. One observer at 500 yards reported seeing 1 round only as a very dull, dull yellow pinpoint flash. There were no observers at 400 yards. Nothing was observed beyond 300 yards. General. The flashes were orange in color and at the firing point each successive flash appeared to be larger than the previous one but this point was not mentioned by the more distant observers.
a. 5 Rounds Semi-automatic	

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Weapon and Ammunition	Results
5. T-25 Rifle, Cal. .30 T-104 Ball	
a. 5 Rounds Semi-automatic	Cold Barrel Visible to a flank up to 300 yards and reported this range as very small very dull white flashes. Forward - All rounds visible to all observers up to 200 yards. Observers at 300 yards and 500 yards reported seeing 4 rounds only. The observer at 800 yards reported seeing one round only. Beyond 100 yards the flashes were reported as very small or pinpoint, dull, with the color varying from white and yellow to dull red. Nothing was observed at 1000 yards. At the firing point the flashes appeared to be orange in color of medium brilliance, about 4 inches long and one inch diameter. Hot Barrel Visible to a flank up to 300 yards where only four rounds were observed. Reported at this range as very small very dull orange flashes. Forward - All rounds were observed at 100 yards and reported as small dull orange flashes. At 200 yards, 300 yards, 500 yards, and 800 yards the first round only was observed. At 500 yards this was reported as a medium sized dull orange flash of medium brilliance. At 800 yards it was reported as a small dull yellow flash. Nothing was observed at 1000 yards. General. The first round was definitely much brighter than the remainder. At the firing point no difference was observed between the hot and cold barrels.
b. 2/3 Round Bursts Automatic	Visible to a flash up to 300 yards where the first burst was reported as a large very bright, bright orange flash and the remainder as small yellow flashes of medium brilliance. Forward - All bursts were visible up to 1000 yards. The first burst was much brighter than the remainder, and was reported as a bright white flash of medium size. The remainder were seen as dull, yellow pinpoint flashes at both 800 yards and 1000 yards. At the firing point the flash appeared to be orange in color, of medium brilliance and about 6 inches long and 4 inches high, at the widest point.

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Weapon and Ammunition	Results
c. 10 Rounds in 1 Burst Automatic	Visible to a flank up to 300 yards where it was reported as a small yellow flash of medium brilliance. Forward - Visible to all observers up to 800 yards where it was reported as a small dull yellow flash. Nothing was observed at 1000 yards. At the firing point the flash was observed as medium bright, orange in color about 6" long and 4" wide at the widest point. General. The color of the flash was erroneously reported as orange, white, yellow, and red. It is characteristic of this weapon when firing automatic, that the flash develops about 3 inches from the muzzle with a very small flash at the muzzle itself.
d. 20 Rounds in 1 Burst Automatic	Visible to a flank up to 300 yards. At this range it was reported as a bright yellow flash of medium size and medium brilliance. Forward - Visible to all observers up to 1000 yards where it was reported as a bright yellow flash of medium size. At the firing point the flash was observed as orange in color, of medium brilliance and about 5 inches long and 3 inches wide at the widest point. It is characteristic of this weapon when firing automatic, that the flash develops about 3 inches from the muzzle with a very small flash at the muzzle itself.

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Test 18
Diagram of Observer
Pattern For
Smoke and Flash

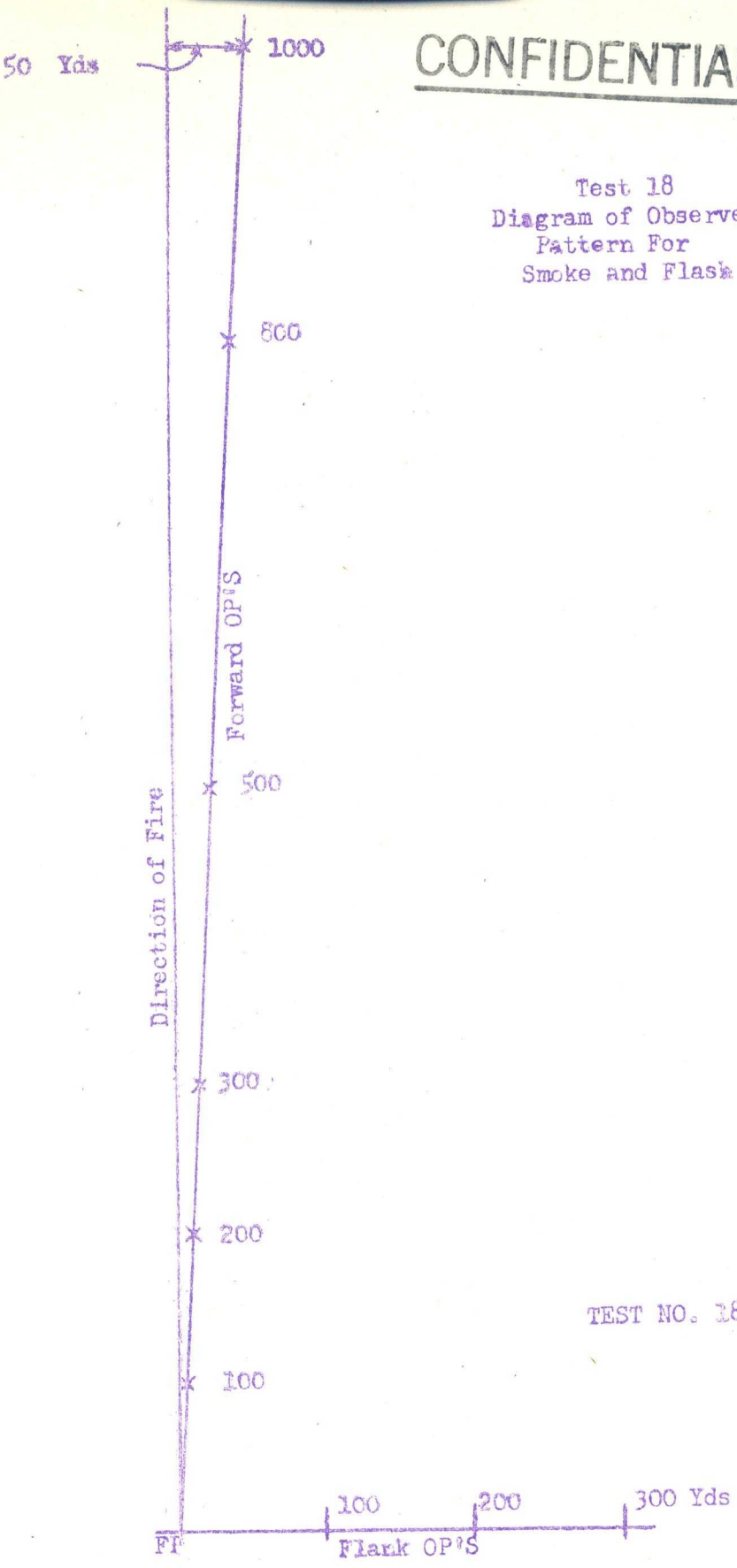

Fig. 3

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Test No. 19

1. Purpose: To determine the efficiency of the test rifles in semi-automatic and automatic fire as assault weapons.

2. Method: This test was conducted in a semi-automatic phase (Phase I) and an automatic phase (Phase II). A diagram of the assault range used in this test is shown in Figure No. 3.

Phase I - (Semi-automatic Fire)

a. Method:

(1) The M-1 rifle was used as a control weapon.

(2) The firing detail consisted of sixteen firers thoroughly familiar with all of the weapons.

(3) Each rifleman fired the course twice with each type rifle.

(4) During the firing facility of manipulating and handling the test weapons was observed.

(5) Each rifleman zeroed his rifle at 25 yards on a kneeling silhouette target before firing the course.

(6) All targets were counter-balanced, disappearing targets, consisting of one or more kneeling silhouettes. A single silhouette represented an enemy rifleman, a double silhouette an automatic rifle team, and a triple silhouette a machine gun.

(7) Between phase lines targets were exposed in sequence on signal from the control officer. Signals were not visible nor audible to the firer.

(8) Phase lines were placed after the 30 yard line and 60 yard line to permit the firer to reload and to assist in the enforcement of safety precautions.

(9) The normal firing position of the rifleman was "off hand" from an "alert" position. The "alert" position permitted was that which was most natural to the firer.

(10) The firer started from the 1st phase line with loaded rifle. On signal from the officer-in-charge, the target (rifleman, automatic rifleman, or machine gun) appeared. As the

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targets were exposed, the soldiers fired one round at each silhouette from the "off hand" position - or the "hip-firing" position.

(11) The single silhouette targets were exposed for 3 seconds, the double silhouettes for 4 seconds, the triple silhouettes for 5 seconds. The firer continued to move forward at the "alert" after engaging each target.

(12) A safety and control officer accompanied each firer.

(13) Scoring:

For each silhouette hit ---------- 5 points
(Ricochets were scored as hits).

"Possible" ---------- 100 points

3. Results:

a. SCORE - SEMI-AUTOMATIC
(Average of All Firers)

Rifle	Rounds Fired	Hits	Score (Based on 100)
EM-2	20	18.3	91.6
FN	20	18.4	92.2
M-1	20	17.5	87.6
T-25	20	17.6	88.0

Figure No. 1

b. Detailed results are listed in Figure No. 4.

c. All firers reported that the test rifles were equally easy to handle.

Phase II - (Automatic Fire)

a. Method: The procedure for automatic fire was the same as for semi-automatic fire except:

(1) As the targets were exposed, the firer fired bursts of two to three rounds at the target from the "off hand" or "hip-firing" position.

(2) Simgle silhouettes were exposed for 5 seconds, double silhouettes for 7 seconds and triple silhouettes for

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9 seconds. Twenty rounds (1 magazine) was allowed for each group of targets between phase lines.

(3) Scoring:

For each silhouette hit		6 points
For each additional hit on a silhouette up to 2		1 point
Total score	Silhouettes hit ---	120 points
	Additional hits ---	32 points
	Total	152 points

3. Results:

a. SCORE - AUTOMATIC
(Average of All Firers)

Rifle	Rounds Fired	Hits	Score (Based on 152)
EM-2	60	25.6	114.8 (75.6%)
FN	60	29.1	125.7 (82.5%)
T-25	60	24.8	105.7 (69.9%)

Figure No. 2

b. For detailed results see Figure No. 5.

4. Analysis:

a. The EM-2 and FN were slightly more effective than the T-25 and the M-1 in delivering assault fire with semi-automatic fire.

b. The FN was the most effective of the test rifles in delivering assault fire with automatic fire. The FN was 6.9% better than the EM-2 and 12.6% better than the T-25.

c. Although the test subjects reported all rifles equally easy to handle, the results of firing would indicate that the test weapons were easier to handle than the M-1, and that the order of handiness of the test rifles was: FN, EM-2 and T-25.

d. All weapons were acceptable.

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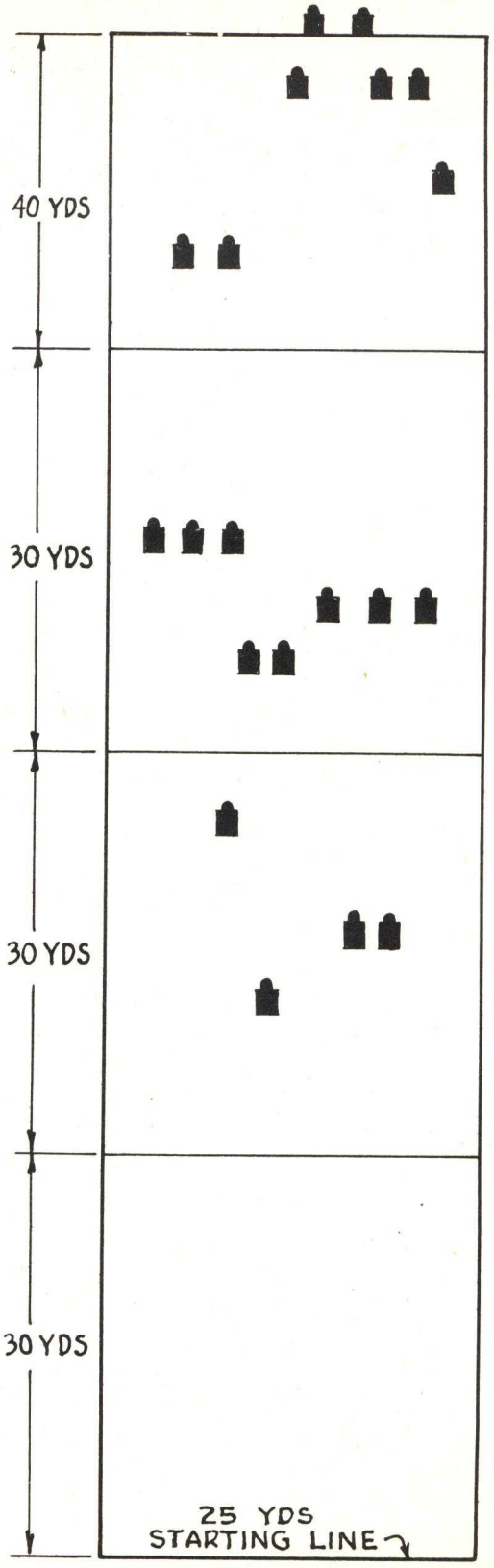
TEST 19

ASSAULT RANGE USED IN BOTH SEMI AUTOMATIC AND AUTOMATIC FIRE



NOT DRAWN TO SCALE

FIG. 3

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Test No. 19:

Combat Target Firing. Semi-automatic

	EM-2		FN		M-1		T-25	
	Hits	Score	Hits	Score	Hits	Score	Hits	Score
1. Thwaites	20	100	19	95	19	95	18	90
	20	100	20	100	18	90	17	85
2. Roberts	17	85	20	100	17	85	20	100
	20	100	18	90	20	100	17	85
3. Martin	18	90	20	100	16	80	17	85
	18	90	19	95	15	75	17	85
4. Herrin	15	75	19	95	20	100	19	95
	19	95	19	95	20	100	20	100
5. White	20	100	20	100	20	100	18	90
	20	100	20	100	18	90	14	70
6. Grigg	18	90	18	90	20	100	17	85
	16	80	20	100	20	100	19	95
7. Foxworth	18	90	17	85	16	80	20	100
	18	90	20	100	16	80	13	65
8. Wideman	20	100	19	95	15	75	16	80
	18	90	20	100	19	95	18	90
9. MacIntyre	20	100	8	40	14	70	15	75
	15	75	18	90	19	95	17	85
10. Gordon	20	100	20	100	19	95	20	100
	16	80	19	95	16	80	20	100
11. Paradis	18	90	16	80	19	95	16	80
	17	85	16	80	18	90	17	85
12. McMinamen	20	100	18	90	16	80	18	90
	20	100	17	85	19	95	18	90
13. Moffatt	18	90	20	100	14	70	18	90
	16	80	20	100	17	85	18	90
14. Coulas	16	80	18	90	17	85	19	95
	18	90	17	85	14	70	14	70
15. Wilson	18	90	17	85	16	80	19	95
	19	95	20	100	18	90	16	80
16. Wertenberger	20	100	19	95	19	95	18	90
	20	100	19	95	17	85	20	100
Total	586	2930	590	2950	561	2805	563	2815
Average	18.3	91.6	18.4	92.2	17.5	87.6	17.6	88.0

Figure No. 4

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Test No. 19:

Combat Target Firing. Automatic.

	EM-2		FN		T-25	
	Hits	Score	Hits	Score	Hits	Score
1. Thwaites	30	130	50	150	21	96
	32	132	36	131	29	114
2. Roberts	36	136	34	134	25	105
	26	126	29	124	27	117
3. Martin	33	133	27	122	31	116
	26	116	30	115	31	131
4. Herrin	31	126	31	131	21	91
	21	96	37	137	17	82
5. White	30	130	34	134	23	108
	17	82	28	128	24	104
6. Grigg	26	121	31	131	29	114
	22	87	31	131	33	118
7. Foxworth	21	101	29	124	29	114
	26	111	23	113	32	117
8. MacIntyre	24	114	27	127	34	129
	28	128	34	129	30	120
9. Gordon	28	118	23	118	24	119
	25	125	28	118	20	90
10. Paradis	27	112	29	129	20	95
	19	94	26	116	29	104
11. McMinamen	28	128	22	117	16	91
	27	117	26	106	15	85
12. Moffatt	34	124	37	137	28	123
	24	114	28	118	24	109
13. Coulas	23	108	32	127	30	130
	23	108	28	118	29	124
14. Wilson	27	117	32	132	28	123
	30	125	30	130	18	88
15. Wertenberger	26	111	27	122	25	105
	18	98	26	126	22	97
16. Wideman	21	101	27	122	29	119
Total	809	3569	932	3897	793	3378
Average	26.1	115.0	30.1	125.7	26.0	109.0

Figure No. 5

Test No. 20:

1. Purpose: To determine the average number of hits obtained per pound of ammunition expended under simulated combat conditions.

2. Method:

a. The number of hits per pound of ammunition expended for each type rifle was computed from the data obtained in:

(1) Test No. 9: Hits obtained under simulated combat conditions from a variety of static firing positions, using both semi-automatic and automatic fire, at field tartets at an average range of 300 yards.

(2) Test No. 13: Hits obtained by a rifle squad firing both semi-automatic and automatic fire from a fixed position at an area target at a range of 250 yards.

(3) Test No. 19: Hits obtained in simulated assault firing at disappearing targets at an average range of 30 yards while advancing, using both semi-automatic and automatic fire.

b. The data obtained on the M-1 in the semi-automatic firing in the above tests was included as a basis for comparison.

3. Results:

a. Note: The number of rounds per pound for the three types of ammunition are: Caliber .280 ball, 21.88; Caliber .30 T-104 Ball, 19.05; Caliber .30 M-2 ball, 17.86.

b. HITS PER POUND - SEMI-AUTOMATIC FIRING

Weapon	Rounds Fired			Hits			Hits Per Pound
	Test No. 9	Test No. 13	Test No. 19	Test No. 9	Test No. 13	Test No. 19	
FN	1052	440	640	459	139	586	12.2
EM-2	1020	440	640	501	123	590	12.7
M-1	1001	440	640	576	119	561	10.8
T-25	961	440	640	612	201	563	12.9

Figure No. 1

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c. HITS PER POUND - AUTOMATIC FIRING

Weapon	Rounds Fired Test No. 9	Rounds Fired Test No. 13	Rounds Fired Test No. 19	Hits Test No. 9	Hits Test No. 13	Hits Test No. 19	Hits Per Pound
EM-2	2560	440	1920	833	63	809	7.6
FN	2560	440	1920	978	78	932	8.8
T-25	2560	440	1920	833	74	793	6.6

Figure No. 2

d. HITS PER POUND - SEMI-AUTOMATIC & AUTOMATIC

Weapon	Total Rds Fired SA & A Firing	Total Hits SA & A Firing	Hits per Pound
EM-2	7052	2889	9.0
FN	7020	3202	10.0
T-25	6961	3076	8.4

Figure No. 3

4. Analysis:

a. In hits per pound in semi-automatic fire only the three test rifles were about equal (T-25, 12.9; EM-2, 12.7; FN, 12.2) and all were superior to the M-1 (10.8).

b. In hits per pound in automatic fire only, the order of merit was FN (8.8), EM-2 (7.6) and T-25 (6.6).

c. In average number of hits obtained per pound of ammunition expended under simulated combat conditions, considering both semi-automatic and automatic fire, the order of merit was FN (10.0), EM-2 (9.0) and T-25 (8.4).

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Test No. 21: Omitted

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Test No. 22:

1. Purpose: To determine the suitability of the test rifles for Airborne use.

2. Method:

The Airborne section of Army Field Forces Board No. 1 studied the weapons and conducted abbreviated tests to determine the suitability of the rifles for Airborne use.

3. Results:

a. See report of Army Field Forces Board No. 1 (Inclosure 1).

b. It is believed that the FN rifle mentioned in Test No. 2, paragraph b, Report of Board No. 1, was actually the EM-2. This is confirmed by Appendix F-7 to Inclosure No. 1.

4. Analysis:

The test rifles are of such shape and size that they can be successfully jumped by standard means. Due to the abbreviate nature of the test no conclusion can be drawn as to their comparative suitability in this respect nor as to their durability to withstand landing stress.

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HEADQUARTERS
ARMY FIELD FORCES BOARD NO. 1
FORT BRAGG, N. C.

GNBA-7 472

SUBJECT: Test of Light Rifles 22 Aug 1950

TO: President
Army Field Forces Board No. 3
Fort Benning, Georgia

1. Major R. L. Wilson, British Liaison Officer with your board, visited this board 31 July 1950 through 3 August 1950. The purpose of his visit was to bring the following experimental lightweight rifles to be tested by this board to determine their suitability for jumping on parachute troops:

a. U. S. T-25 Rifle.

b. British FN-9 Rifle.

c. British EM-2 Rifle.

2. a. The rifles were jumped by parachutists in the following methods:

(1) Without a container.

(2) Inside Container, Rifle, Adjustable, secured to the parachute harness.

(3) Inside Container, Rifle, Adjustable and lowered on a 20-foot lowering strap during the descent of the parachutists.

b. Results of the tests are included as Inclosure 1 to this letter.

3. Conclusions: The British and U. S. Light Rifles under consideration are suitable for jumping on parachute troops.

4. Recommendations: The British and U.S. Light Rifles under consideration be considered suitable for jumping on parachute troops.

/s/Louis J. Compton
/t/ LOUIS J. COMPTON
Colonel, Field Artillery
President

1 Incl
Results of Tests
with Appendix F-1
through F-8

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AIRBORNE SERVICE TEST DIVISION
ARMY FIELD FORCES BOARD NO. 1
FORT BRAGG, N. C.

RESULTS OF TESTS

Test No. 1

a. Purpose: To determine if the rifles could be satisfactorily jumped by paracnutists without placing the rifles in weapons containers.

b. Method: Each rifle was slung over the shoulder of the paracnutist and secured to his body by means of the reserve waistband (Appendix F-1, F-2, F-3). In addition to one magazine of ammunition inserted into each rifle, one belt containing six magazines was worn around the waist and under the harness of each paracnutist (Appendix F-4).

c. Results: The stock of the T-25 Rifle was slightly cracked after this test, however, the crack did not interfere with the firing of the rifle (Appendix F-5). The EM-2 Rifle failed to fire automatically after this test since sand and dirt had entered the receiver of the rifle upon the landing of the paracnutist. Two of the three parachutists who jumped with ammunition belts received minor bruises from the belts.

Test No. 2

a. Purpose: To determine if the rifles could be satisfactorily jumped by paracnutists inside a Container, Rifle, Adjustable, and secured to the paracnute harness.

b. Method: Each rifle was placed in a Container, Rifle, Adjustable, with three magazines of ammunition and one bandoleer of M2 ammunition (Appendix F-6, F-7, F-8). A bandoleer of M2 ammunition was used to simulate a bandoleer of experimental ammunition in the test. Sufficient felt padding was included to prevent contact between the contents of the container. Since the dimensions of the container did not permit the container to be closed when carrying the FN-9 Rifle, the container was secured by the use of masking tape in place of the zipper provided for that purpose (Appendix F-7).

c. Results: No damage was incurred to either the weapons or the ammunition and no injuries were received by the paracnutists.

Test No. 3

a. Purpose: To determine if the rifles could be satisfactorily jumped by paracnutists inside a Container, Rifle, Adjustable, and lowered on a 20-foot lowering strap during the descent of the paracnutists.

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b. Method: The rifles were packaged in the same manner as in Test No. 2. All three rifles and containers were lowered by parachutists during their descent.

c. Results: No damage was incurred to either the weapons or the ammunition and no injuries were received by the parachutists.

Inclosure No. 1, T-22

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Army Field Forces Board No. 1
Airborne Service Test Division
Negative No. LTR 33-1950

Fort Bragg, N.C.
Date 16 AUG 1950
Appendix F-1

U. S. LIGHT RIFLE T-25 SLUNG OVER SHOULDER AND SECURED BY RESERVE WAISTBAND.

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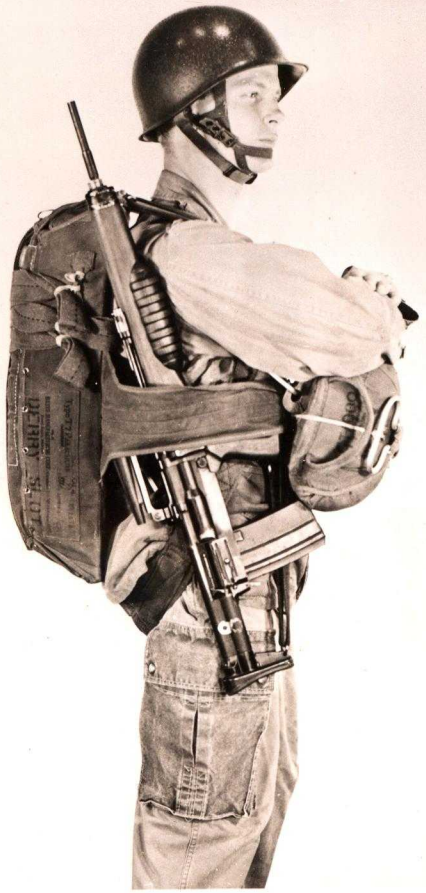

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Army Field Forces Board No. 1

Airborne Service Test Division

Negative No. LTR 33-1950

Fort Bragg, N.C.

Date 16 AUG 1950

Appendix F-2

BRITISH LIGHT RIFLE EM-2 SLUNG OVER SHOULDER AND SECURED BY RESERVE WAISTBAND. NOTE UNDESIRABLE PROJECTION OF RIFLE BARREL ABOVE PARACHUTIST'S SHOULDER. RIFLE WAS SLUNG IN THIS FASHION BECAUSE OF THE POSITION OF OPERATING ROD HANDLE AND MAGAZINE RELEASE CATCH.

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Army Field Forces Board No. 1

Airborne Service Test Division

Negative No. LTR 33-1950

Fort Bragg, N.C.

Date 16 AUG 1950

Appendix F-3

BRITISH LIGHT RIFLE FN-9 SLUNG OVER SHOULDER AND SECURED BY RESERVE WAISTBAND. NOTE UNDESIRABLE PROJECTION OF RIFLE BARREL ABOVE PARACHUTIST'S SHOULDER. RIFLE WAS SLUNG IN THIS FASHION BECAUSE OF THE POSITION OF THE OPERATING ROD HANDLE AND HAND GRIP.

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Army Field Forces Board No. 1
Airborne Service Test Division
Negative No. LTR 33-1950

Fort Bragg, N.C.
Date 16 AUG 1950
Appendix F-4

MAGAZINE BELT CONTAINING SIX MAGAZINES WORN UNDER PARACHUTE HARNESS.

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Army Field Forces Board No. 1
Airborne Service Test Division
Negative No. LTR 33-1950

Fort Bragg, N.C.
Date 16 AUG 1950
Appendix F-5

U. S. LIGHT RIFLE T-25
(A) CRACK IN STOCK.

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Army Field Forces Board No. 1
Airborne Service Test Division
Negative No. LTR 33-1950

Fort Bragg, N.C.
Date 16 AUG 1950
Appendix F-6

BRITISH LIGHT RIFLE FN-9 IN CONTAINER, RIFLE, ADJUSTABLE.

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Army Field Forces Board No. 1 — **Fort Bragg, N.C.**

Airborne Service Test Division — *Date* 16 AUG 1950

Negative No. LTR 33-1950 — *Appendix* F-7

BRITISH LIGHT RIFLE EM-2 IN CONTAINER, RIFLE, ADJUSTABLE. NOTE THE USE OF MASKING TAPE TO SECURE THE CONTAINER.

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Army Field Forces Board No. 1 — **Fort Bragg, N.C.**

Airborne Service Test Division — *Date* 16 AUG 1950

Negative No. LTR 33-1950 — *Appendix* F-8

U. S. LIGHT RIFLE T-25 IN CONTAINER, RIFLE, ADJUSTABLE.

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T-23

Test No. 23:

1. Purpose: To determine the suitability of test rifles for use by Armored Infantry and Armored personnel.

2. Method: The Armored School and Army Field Forces Board No. 2, Fort Knox, Kentucky, were requested to study the rifles and conduct such tests as necessary to determine their satisfactoriness for use by Armored and Armored Infantry personnel.

3. Results: See inclosed report of Army Field Forces Board No. 2, Fort Knox, Kentucky (Inclosure 1).

4. Analysis:

a. Armored Infantry and Armor have the same requirement for a lightweight rifle as Infantry except for suitability for stowage, and for firing through restricted openings, in armored vehicles.

b. For stowage and firing through restricted openings the order of merit is EM-2, FN, and T-25. All are acceptable.

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ARMY FIELD FORCES BOARD NO. 2
Fort Knox, Kentucky

AKCW IP-68 6 Sep 1950

SUBJECT: Comparative Test of British and U. S. Light Rifles

TO: President
Army Field Forces Board No. 3
Fort Benning, Georgia

1. AUTHORITY: Verbal Order, President, Army Field Forces Board No. 2, 18 July 1950. The purpose of this test was to determine the suitability of the test rifles for use by armored infantry and tank crewmen.

2. REFERENCES.

a. Ltr, AFF Board No. 3, GNBCG P-2231 x 474, 10 July 50, subject: "Test of Light Rifles for Armored Use."

b. Ltr, AFF Board No. 2, AKCV 470.8/2, 30 Aug 49, subject: "Vehicle Equipment List For Medium Tanks, M46 and T40."

c. 3d ind, AFF Bd No. 2, AKCV 470.81, (22 Sep 49), 13 Oct 49 to ltr, Ordnance Department Detroit Arsenal, ORDMX-DDS, 20 Sept 49, subject: "Vehicle Equipment List."

3. DESCRIPTION OF MATERIEL. The equipment used in connection with this project consists of three lightweight rifles described briefly as follows:

a. U. S. Light Rifle, T25. This rifle is a light, compact, shoulder weapon which delivers both full and semiautomatic fire, selectively. It is gas operated, magazine fed (20 rd), 42 inches long, 7 pounds in weight, and is chambered for the new T65E1, cal .30 cartridge.

b. British Light Rifle, EM2. This is a lightweight, cal .28 compact, shoulder weapon which delivers both full and semiautomatic fire, selectively. It is gas operated, magazine fed (20 rd), approximately 7 inches shorter than U. S. rifle, T25.

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c. British Light Rifle, FN. This rifle was made in Belgium for the British Army. It is a lightweight, cal .28, compact, shoulder weapon which delivers both full and semiautomatic fire, selectively. It is gas operated, magazine fed, approximately 5 inches shorter than U. S. rifle, T25, but somewhat heavier by approximately 1 1/2 pounds.

4. BACKGROUND.

a. The requirement for a lightweight rifle to replace all present individual shoulder fired small arms including the BAR was established by the Report of the Army Equipment Board, 8 March 1950, as follows:

> "A lightweight caliber, .30 rifle is required which, with minor modifications, is capable of replacing all present, individual shoulder fired small arms including the BAR. Eventually, this rifle should have the following general military characteristics: 7-pound maximum weight (basic), selective semiautomatic and automatic fire, with rate of fire approximately 700 rounds per minute; combat performance equal to or better than the rifle, M1, and Browning Automatic Rifle, the shape and manner of performance of the rifle such that it is usable by all personnel who meet the physical requirements of Army Field Forces; capable of mounting a bayonet-knife and flash hider, of launching a grenade, and being jumped on a parachutist. Rugged, simple, effective combat sights shall be provided. It shall be adaptable for use by tank crewmen and armored infantry."

b. Development of rifles to meet the established requirement has been under way for some time. To date, the only U. S. rifle that approaches the established requirement is the T25. However, through standardization agreements two British lightweight rifles have been made available for comparative tests with the T25.

c. AFF Board No. 3 P-2231 was established for the purpose of comparing the British and U. S. rifles. In conjunction with such test this board was requested by Board No. 3 to test these rifles to determine their suitability for use by armored infantry and tank crewmen (see reference 2a).

5. SUMMARY OF TESTS.

a. Method. This board and representatives of the Armored School witnessed and participated in a firing demonstration and conducted stowage tests with each type of rifle on the following vehicles:

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SUBJECT: Comparative Test of British and U. S. Light Rifles

(1) Light Tank, T41.

(2) Light Tank, M24.

(3) Medium Tank, M46.

(4) Medium Tank, M26.

(5) Armored Utility Vehicle, M44.

b. Results.

(1) All test rifles can be properly stowed in the above mentioned vehicles, as shown in inclosures 1 through 12. In these inclosures the only rifle shown is Light Rifle, T25. The British Light rifles can also be stowed in the same positions inasmuch as they are both shorter than the T25. However, difficulty was encountered in removing the T25 from several of these locations due to its length.

(2) The British Light Rifle, FN, was stowed as shown in inclosures 13 and 14. In these locations the U. S. Rifle, T25, would not fit due to its length.

(3) In addition to the locations shown in subparagraphs b(1) and (2), above, the British Light Rifle, EM2, was stowed as shown in inclosures 15 through 20. Neither the U. S. Light Rifle, T25, nor the British Light Rifle, FN, would fit in these locations.

(4) Although the folding sights on the U. S. Light Rifle, T25, do not preclude acceptance, they do affect the speed with which this rifle can be placed in action through restricted openings from armored vehicles and they are susceptible to damage when thrust through such openings.

6. DISCUSSION.

a. Each tank crewman is armed with a cal. .45 pistol. As authorized and agreed in references 2b and 2c, each tank will be equipped with one carbine cal. .30 and one submachine gun, cal. .45, M3A1, as on-vehicle equipment. In the event that one of the light rifles under test is adopted as the standard weapon, then a one for one substitution

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b. Linear dimensions are critical for stowage in tanks because of limited space. Hence the smaller the dimensions of any piece of equipment, the greater flexibility in stowage. In stowage tests of the 3 light rifles, there were sufficient locations available to stow at least 2 of each type rifle in accordance with the current requirement noted in subparagraph a, above. However, there was at least one additional location in the test vehicles for stowage of the EM2 and the FN rifles because of their shorter length.

7. CONCLUSIONS. Army Field Forces Board No. 2 concludes that:

a. The dominant characteristics of the lightweight rifle finally adopted must meet the requirement for infantry use including armored infantry.

b. The acceptability of the infantry adopted weapon as a replacement for the sub-machine gun and carbine now authorized as a vehicular mounted crew weapons for tanks is dependent for the most part of its physical dimensions which affect stowage locations. The length dimension and general compactness are more critical than other characteristics.

c. As the result of limited trials herein reported it is apparent that any of the three lightweight rifles tested will satisfy basic requirements for emergency crew defense and security purposes for armored use.

d. The requirement for reliability and ease of assembly-disassembly is generally the same for all users of the weapon.

8. RECOMMENDATIONS. Army Field Forces Board No. 2 recommends that:

a. In the final selection of a suitable lightweight rifle consideration be given to ease of assembly-disassembly, compactness, and minimum length all consistent with infantry requirements.

b. The lightweight rifle accepted for use by infantry be accepted for use by armored infantry and as a replacement for the carbine and the submachine gun now authorized for tanks.

9. The Armored School concurs with the recommendation stated above.

FOR THE PRESIDENT: CONFIDENTIAL

/s/S. G. Brown, Jr.
/t/S. G. BROWN, JR.
Lt. Col., Armor

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Photographs

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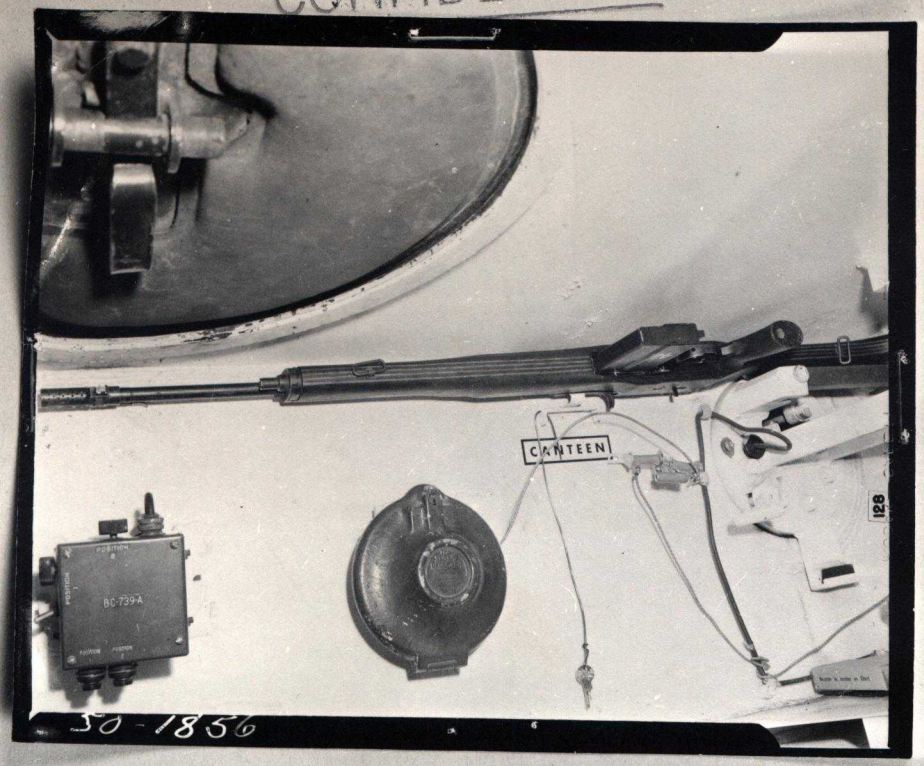

ARMY FIELD FORCES BOARD NO. 2. NO. 50-1856 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND US LIGHT RIFLES

Light Tank, T41; view of US Light Rifle, T25, stowed on the underside of turret roof, right rear.

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ARMY FIELD FORCES BOARD NO. 2. ~~50-1855~~ IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, T41; view of U.S. Light Rifle, T25, stowed on underside of rear roof above radio.

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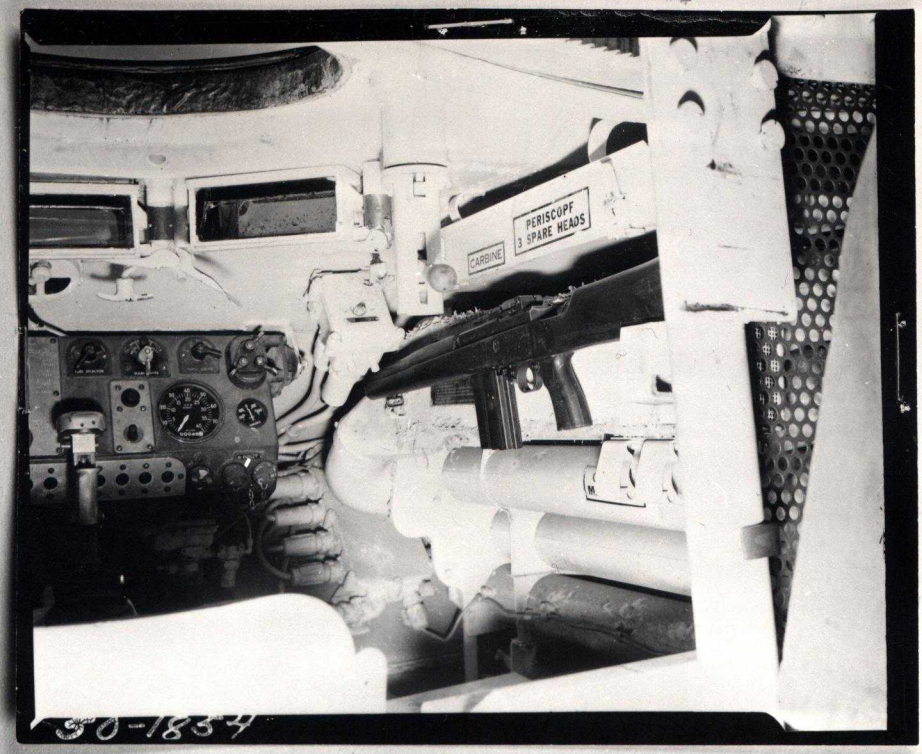

ARMY FIELD FORCES BOARD NO. 2. NO. P- 50-1854 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, T41; view of U.S. Light Rifle, T25, stowed on driver's compartment in the place originally selected for carbine caliber .30, M1. Difficulty is encountered in removing the rifle from this location due to its length.

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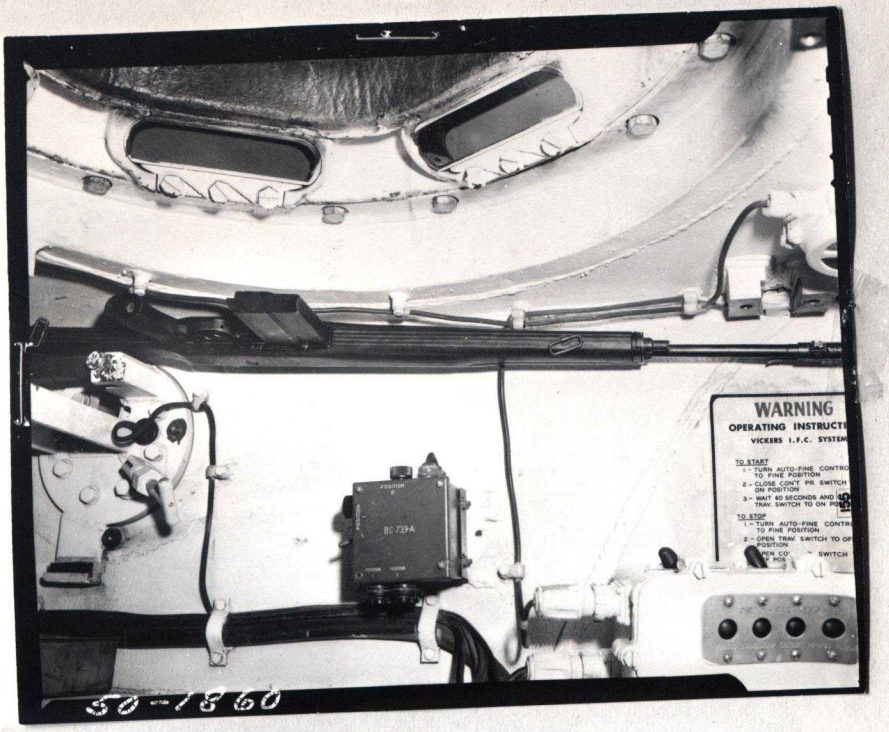

ARMY FIELD FORCES BOARD NO. 2. ~~50-1860~~ IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, T41; view of U.S. Light Rifle, T25, stowed on turret roof above blister machine gun mount.

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ARMY FIELD FORCES BOARD NO. 2. NO. 50-1871 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; view of U.S. Light Rifle, T25, stowed on rear turret roof just forward of radio. Difficulty is encountered in removing the rifle from this location due to its length.

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ARMY FIELD FORCES BOARD NO. 2. NO. P- 50-1869 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; view of U.S. Light Rifle, T25, stowed on hull wall, right side of assistant driver's compartment.

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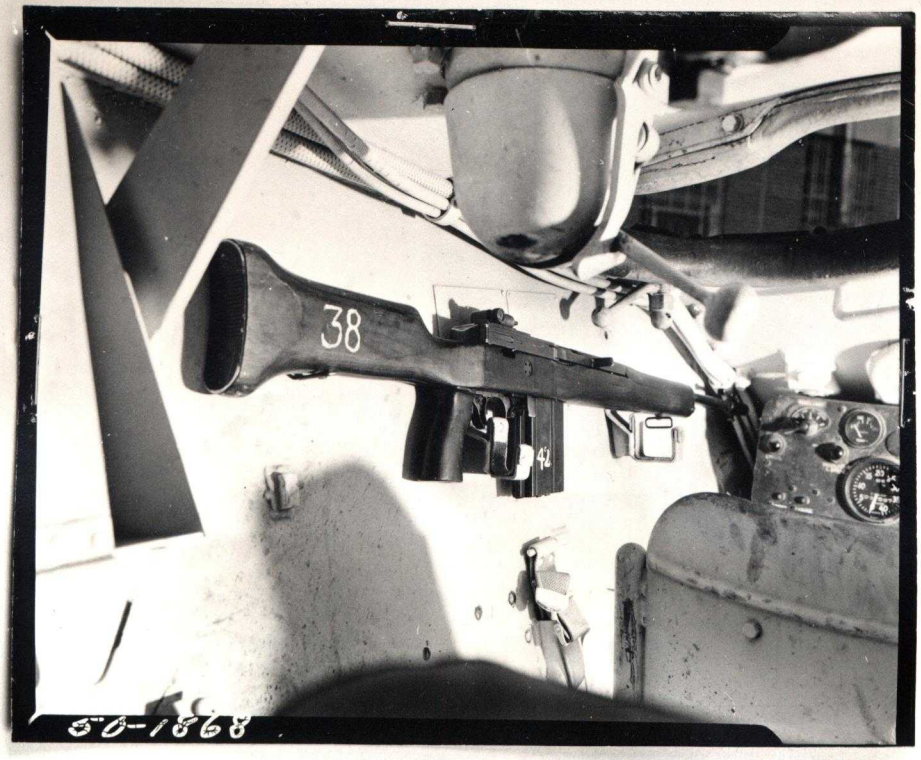

ARMY FIELD FORCES BOARD NO. 2. NO. 50-1868 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; view of U.S. Light Rifle, T25, stowed on hull wall of driver's compartment.

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ARMY FIELD FORCES BOARD NO. 2. NO. 50-1870 P- IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; view of U. S. Light Rifle, T25, stowed on right fender.

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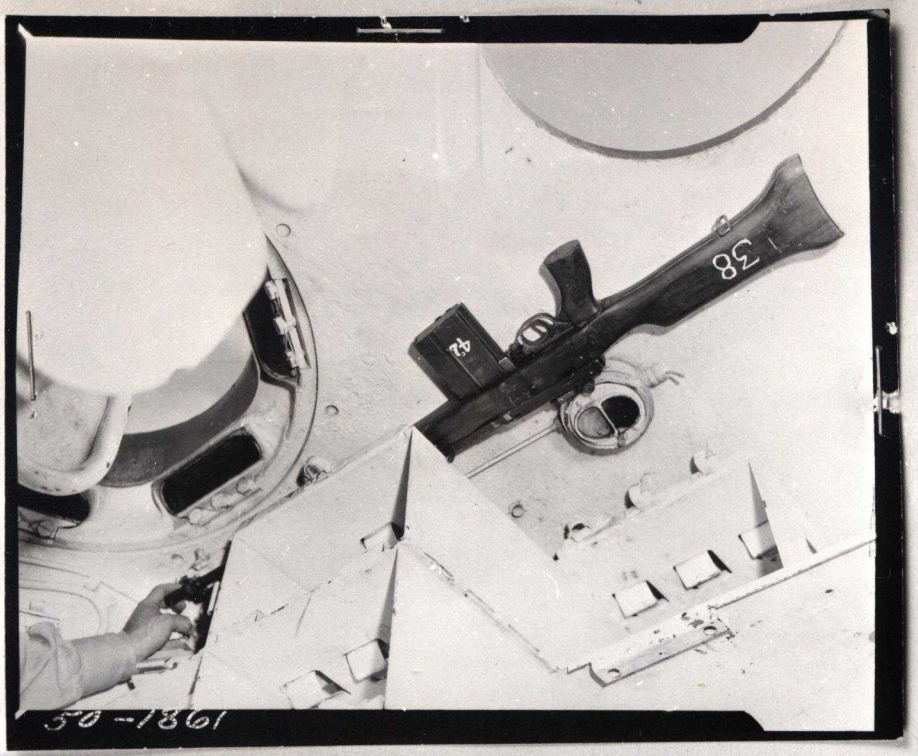

ARMY FIELD FORCES BOARD NO. 2. NO. P- 50-1861 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M26; view of U.S. Light Rifle, T25, stowed on underside of turret roof just forward of radio.

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ARMY FIELD FORCES BOARD NO. 2. NO. P- 50-1865 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M46; view of U.S. Light Rifle, T25, stowed on the underside of the hull front slope on the driver's side. The rifle may also be placed in corresponding location on the assistant driver's side.

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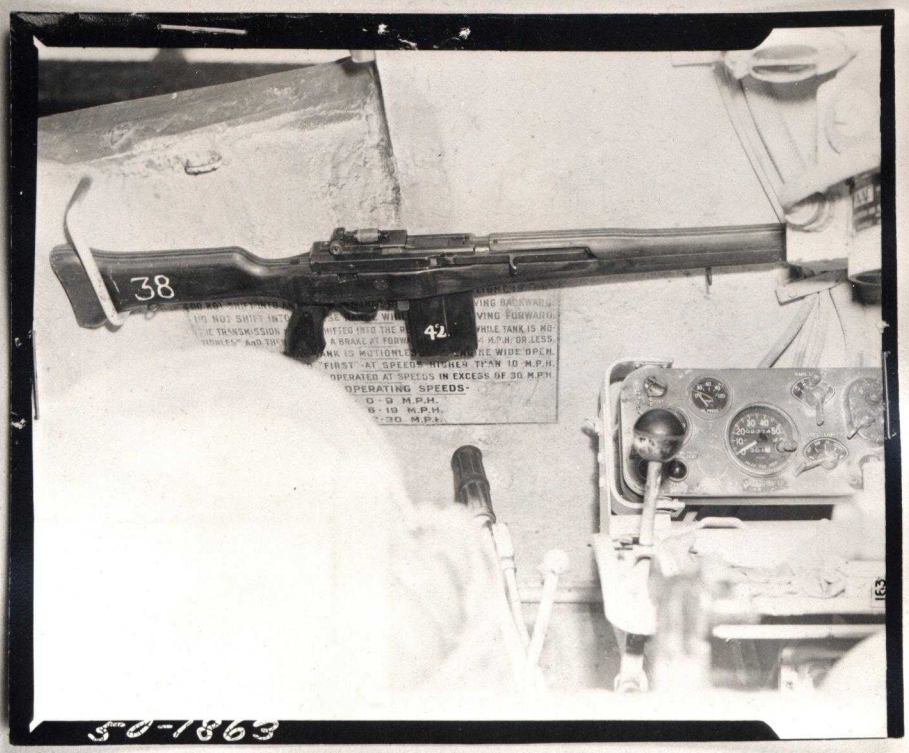

ARMY FIELD FORCES BOARD NO. 2. ~~50-1863~~ IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M26; view of U.S. Light Rifle, T25, stowed on the underside of hull front slope on the driver's side. It also may be placed in corresponding location on the assistant driver's side.

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ARMY FIELD FORCES BOARD NO. 2. 50-1862 NO. P-IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M46; view of U.S. Light Rifle, T25, stowed on turret roof, right rear, above radio.

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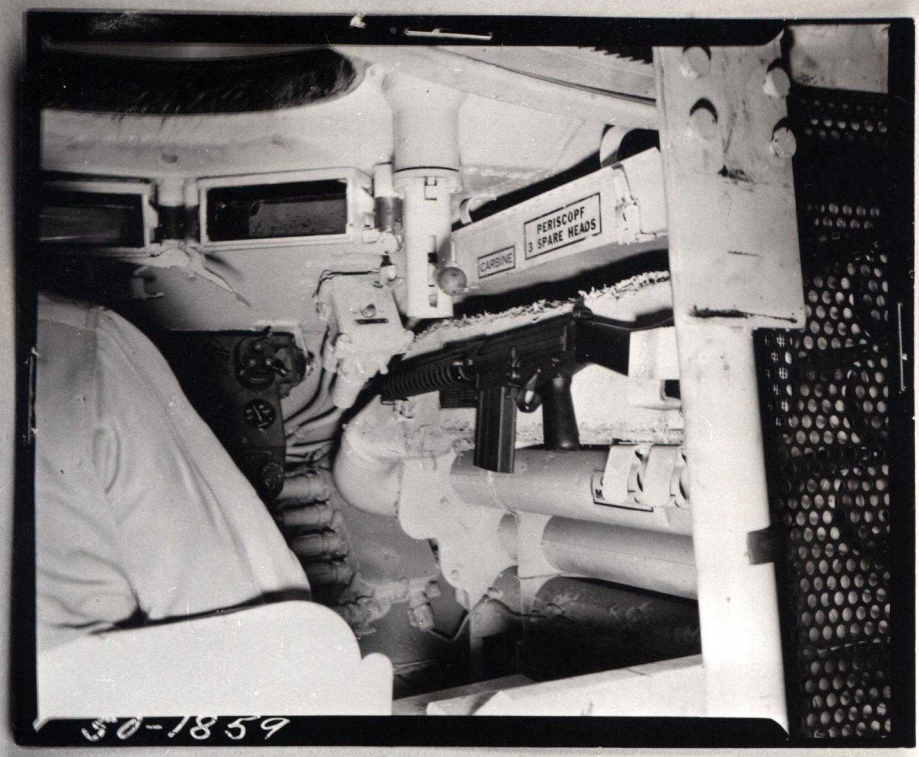

ARMY FIELD FORCES BOARD NO. 2. NO. 50-1859 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, T41; British Light Rifle, FN, stowed on insulated walls of personnel heater in the place originally selected for the carbine, cal .30, M1.

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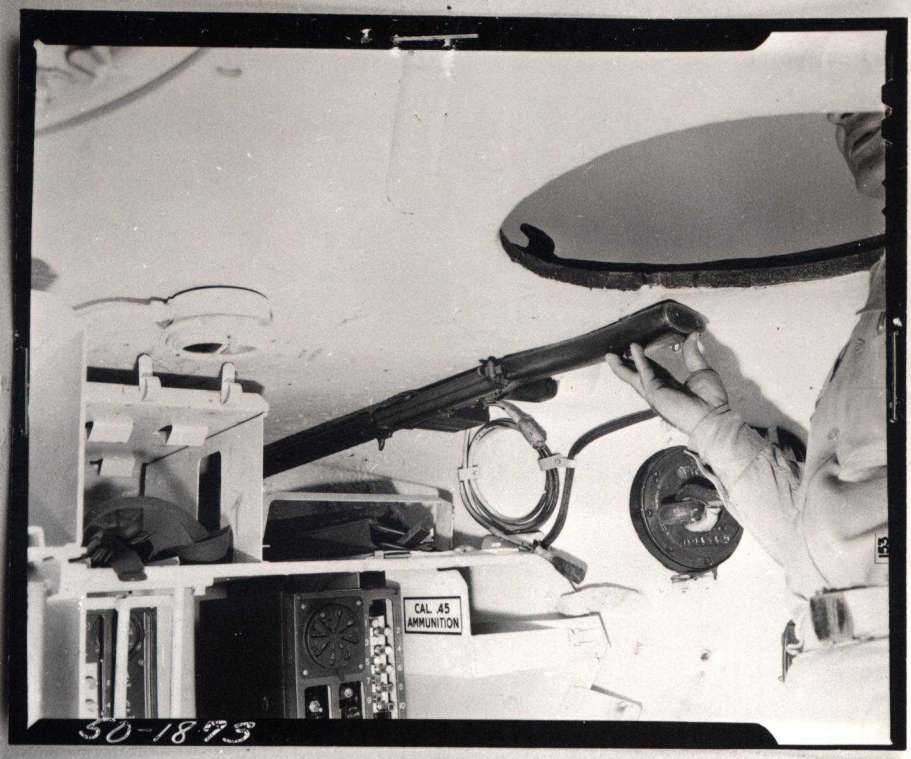

ARMY FIELD FORCES BOARD NO. 2. No. 50-1873 IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M46; view of British Light Rifle, FN, stowed on the underside of turret roof, left rear. The EM2 rifle will also fit in this location, however the T25 will not, due to its length.

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ARMY FIELD FORCES BOARD NO. 2. ~~50-1867~~ NO. P- IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M26; view of British Light Rifle, EM2, stowed on the under side of turret wall, left side.

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ARMY FIELD FORCES BOARD NO. 2. NO. 50-1864 P-IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; British Light Rifle, EM2, stowed on hull wall on left side of assistant driver's compartment. No other test rifle will fit in this location due to length.

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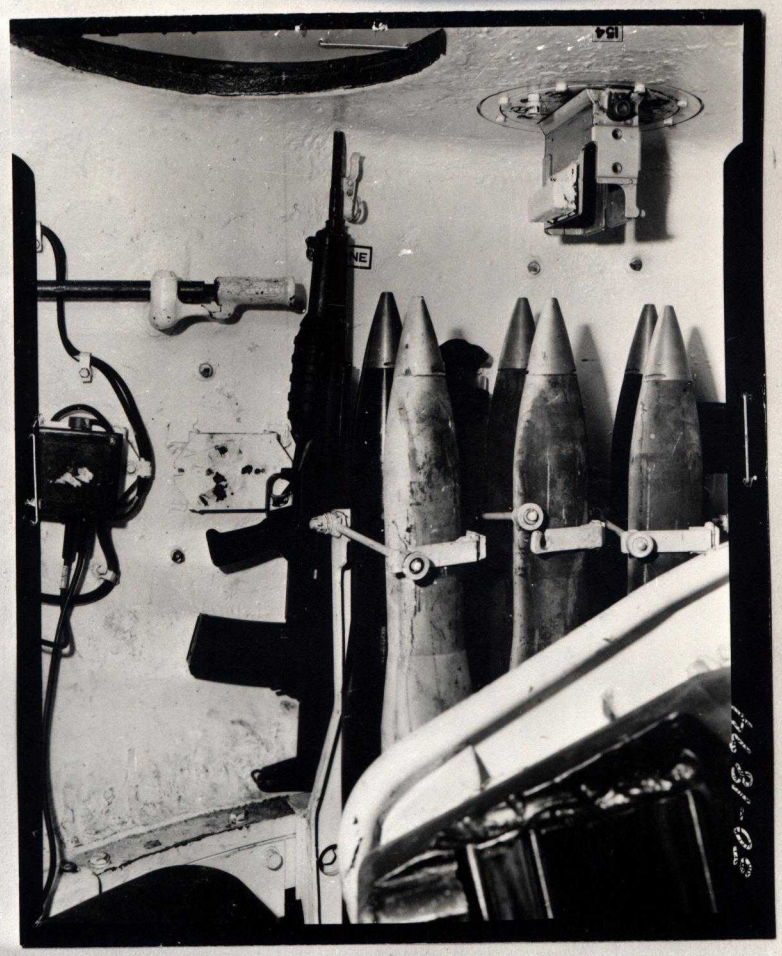

ARMY FIELD FORCES BOARD NO. 2. NO. 50-1874 P- IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Medium Tank, M46; view of British Light Rifle, EM2, stowed on turret wall on loader's side behind ready rack.

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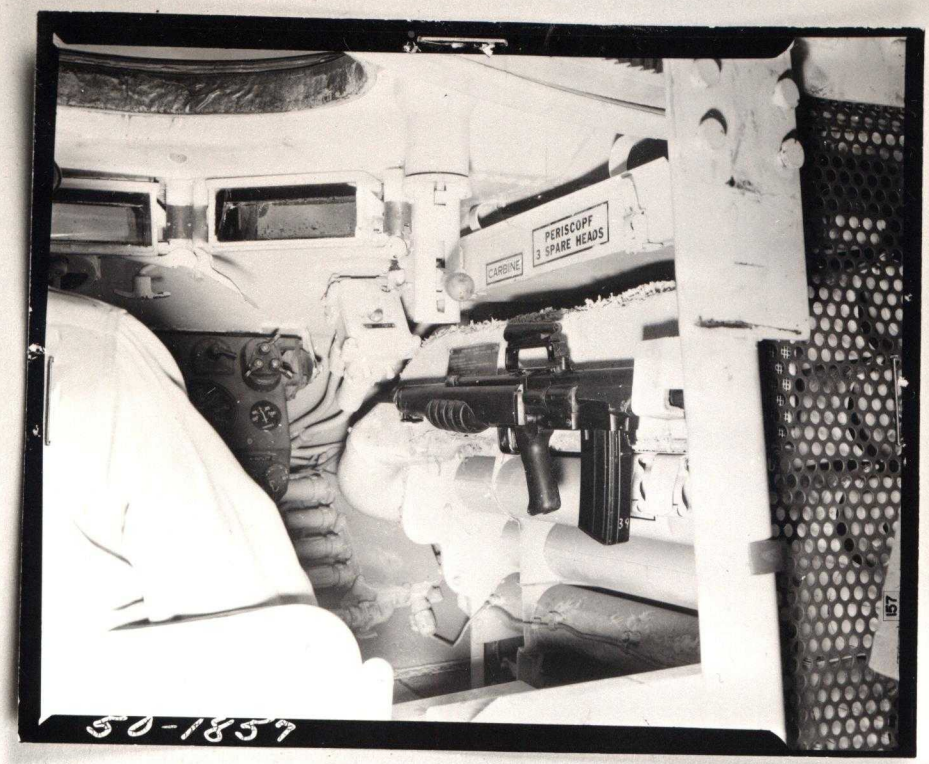

ARMY FIELD FORCES BOARD NO. 2. ~~50-1857~~ NO. 1 - IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES.

Light Tank, T41; view of British Light Rifle, EM2, stowed on right side of driver's compartment in the place originally selected for the carbine, cal .30, M1.

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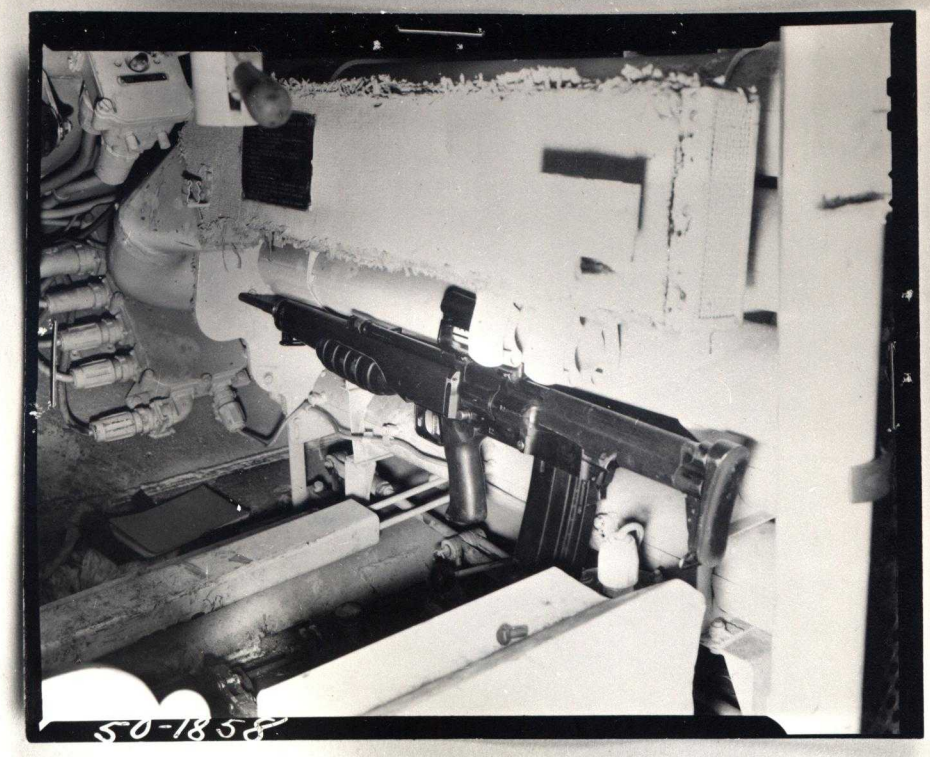

ARMY FIELD FORCES BOARD NO. 2. NO. 50-1858 P-IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, T41; view of British Light Rifle, EM2, stowed on right side of driver's compartment in the place originally selected for the sub-machine gun, cal .45.

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ARMY FIELD FORCES BOARD NO. 2. NO. 50-1872 P- IP-68 FORT KNOX, KENTUCKY

COMPARATIVE TEST OF BRITISH AND U.S. LIGHT RIFLES

Light Tank, M24; view of British Light Rifle, EM2, stowed on hull wall, left rear of driver's compartment. No other test rifle can be stowed in this location.

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Test No. 24:

1. Purpose: To determine the suitability of the sling as a means of carrying the test rifles and as a firing support.

2. Method:

a. The U. S. Rifle M-1, with sling, was used as a control item.

b. Identical web slings were provided with the EM-2 and the FN rifles. The T-25 was tested with the leather sling used with the U. S. Rifle M-1 inasmuch as no sling was provided with the weapon as received.

c. During limited carrying and all firing tests, the use of the sling was observed and its suitability as a means of carrying and as a firing support noted.

3. Results:

a. Adequacy as Firing Support.

(1) EM-2 and FN: The test sling was difficult to adjust properly. It did not give adequate support in either the hasty or loop sling adjustment because the wire loop catches at each end of the sling failed to hold.

(2) T-25 and M-1: The M-1 sling gave adequate firing support in both the hasty and loop sling adjustments.

b. Adequacy as a Means for Carrying.

(1) EM-2 and FN: The test sling caused discomfort to test personnel while carrying the rifles because the thin webbing of the slings rolled.

(2) T-25 and M-1: The M-1 sling proved adequate with both rifles.

c. Due to the deficiencies in the test sling for the EM-2 and FN rifles, its use was discontinued in the course of the firing tests and the leather sling for the M-1 rifle was substituted.

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Test No. 25:

1. Purpose: To determine the length of time required to raise the sights (if folding sights are provided), and aim the rifles.

2. Method:

a. The U. S. M-1 Rifle was used as a control item.

b. Seven men were each required to get into the prone position from the standing position, and to aim and fire one shot at a range of 200 yards. Next, they were required to aim and fire one shot from the standing position. In each trial the time required was noted with a stop watch. Each shot was spotted and only accurate shots recorded (Inaccurate shots were refired). Using each type of rifle, each man made three trials of each type firing. Using the T-25 rifle, the tests were conducted with the sights down at the start of each trial, and then repeated with the sights up. The other two test rifles and the control rifle do not have folding sights.

3. Results:

(details in figures 2 and 3)

AVERAGE TIME OF ALL MEN FOR THREE TRIALS

	Standing To Prone	Standing
EM-2	5.3 seconds	3.6 seconds
FN	4.8 seconds	3.3 seconds
M-1	5.2 seconds	3.5 seconds
T-25 (sights up)	5.5 seconds	3.8 seconds
T-25 (sights down)	6.1 seconds	4.9 seconds

Figure No. 1

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TIME REQUIRED STANDING TO PRONE TO AIM AND FIRE A SHOT

Firer	Trials			Average
M-1				
Roberts	5.0	5.0	5.0	5.0
Foxworth	5.4	6.0	5.0	5.46
Paille	6.0	6.0	5.0	5.66
Coulas	5.0	5.6	5.4	5.33
Wilson	5.0	4.8	4.2	4.66
Paradis	4.8	4.4	5.0	4.7
Moffatt	5.4	6.0	5.6	5.66
			Average	5.2
EM-2				
Roberts	5.4	5.4	6.0	5.6
Foxworth	5.6	5.0	5.6	5.4
Paille	5.4	6.2	4.8	5.46
Coulas	5.4	5.6	6.6	5.86
Wilson	6.2	5.4	4.8	5.46
Paradis	5.2	4.0	4.4	4.53
Moffatt	4.0	5.4	4.8	4.73
			Average	5.4
T-25 (Sights up)				
Roberts	7.2	6.4	5.6	6.4
Foxworth	6.0	6.0	6.0	6.0
Paille	5.0	5.0	5.8	5.26
Coulas	6.0	6.6	4.8	5.8
Wilson	4.8	4.6	4.0	4.46
Paradis	4.2	5.0	5.2	4.8
Moffatt	6.8	5.2	4.6	5.53
			Average	5.5
FN				
Roberts	4.2	5.4	5.2	4.86
Foxworth	6.8	4.0	5.0	5.26
Paille	5.6	4.8	4.0	4.8
Coulas	4.4	5.0	5.0	4.8
Wilson	4.8	4.4	5.0	4.4
Paradis	4.8	4.0	3.6	4.13
Moffatt	6.0	5.2	5.0	5.4
			Average	4.8
T-25 (Sights down)				
Roberts	5.0	6.4	5.4	5.6
Foxworth	8.0	6.0	7.0	7.0
Paille	5.2	6.0	7.0	6.06
Coulas	7.0	5.8	6.8	6.53
Wilson	5.2	5.4	5.0	5.3
Paradis	4.8	6.0	6.0	5.6
Moffatt	6.0	6.6	6.8	6.46
			Average	6.1

Figure No. 2

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TIME REQUIRED STANDING TO AIM AND FIRE A SHOT

	Trials			Average
M-1				
Roberts	4.0	3.8	3.2	3.66
Foxworth	4.8	3.0	3.0	3.6
Paille	3.6	4.6	3.2	3.8
Coulas	3.2	3.0	4.0	3.4
Wilson	3.0	3.0	2.4	2.8
Paradis	3.6	3.0	3.4	3.33
Moffatt	4.6	3.2	3.6	3.8
			Average	3.5
T-25 (Sights up)				
Roberts	4.6	3.8	3.0	3.8
Foxworth	5.2	5.0	3.8	4.66
Paille	3.6	5.0	3.6	4.06
Coulas	5.0	4.2	3.0	4.06
Wilson	2.6	2.4	2.6	2.53
Paradis	3.6	2.6	3.6	3.26
Moffatt	4.0	4.0	4.6	4.2
			Average	3.8
FN				
Roberts	3.4	3.0	2.6	3.0
Foxworth	3.8	3.8	3.8	3.8
Paille	4.0	3.2	4.0	3.73
Coulas	4.0	3.6	3.2	3.6
Wilson	2.8	2.6	3.2	2.86
Paradis	3.2	2.4	2.4	2.66
Moffatt	3.2	3.4	3.6	3.4
			Average	3.3
EM-2				
Roberts	3.6	3.4	3.4	3.46
Foxworth	4.8	4.0	3.2	4.0
Paille	5.6	5.4	3.2	4.73
Coulas	3.4	3.0	3.6	3.33
Wilson	3.4	3.0	3.0	3.13
Paradis	2.8	2.8	2.2	2.6
Moffatt	3.8	3.6	4.6	4.0
			Average	3.6
T-25 (Sights down)				
Roberts	6.0	4.2	4.4	4.86
Foxworth	5.0	6.2	4.8	5.0
Paille	6.4	5.2	5.4	5.66
Coulas	5.0	5.2	4.8	5.0
Wilson	4.2	5.2	4.6	4.66
Paradis	4.4	3.6	5.0	4.33
Moffatt	5.0	4.8	5.0	4.93
			Average	4.9

Figure No. 3

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4. Analysis:

a. From both the Prone and Standing positions the order of merit in sighting, aiming and firing the rifles is FN, M-1, EM-2, T-25 (sights up) and T-25 (sights down).

b. The only rifle that is quicker than the U. S. M-1 Control Rifle is the FN.

c. The time required to sight, aim and fire the T-25 with sights down is excessive.

d. This test is not only concerned with sighting and aiming but also with handiness. However, it is impossible to evaluate the handiness factor in the results obtained.

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Test No. 26

1. Purpose: To determine the ease of handling the rifles.

2. Method:

a. During all tests, particularly those involving firing, test officers observed the handling of each type of rifle.

b. Questionnaires which referred to the ease of handling were answered by all firers.

3. Results:

a. Adoption of Firing Positions: There was no material difference in the ease with which the various firing positions could be adopted by men armed with any of the test rifles or the M-1 rifle. (For details, see Test No. 15).

b. Ease and Speed of Aiming and Firing: Seven firers were required to aim and fire an accurate shot from the prone and standing positions. The order of merit was FN, M-1, EM-2 and T-25. The difference between the T-25 and the other rifles was increased if the initial raising of sights was taken into account. (For detailed results, see Test No. 25).

c. Ease of Handling in Thick Cover: The order of merit in handling the rifles in thick cover was FN, M-1, EM-2, and T-25. This order was based largely on observations made during Test 17-1/2. Although in that test the M-1 rifle became entangled in vegetation slightly less frequently than the FN, the latter was the handier of the two weapons.

d. Magazine Changing: The order of merit for ease and speed of magazine changing was: First EM-2, second FN, third T-25. (For details, see Test No. 31).

e. Firers' Opinion on General Handiness: The opinion of firers on general handiness and ease of operating, based on questioning them at the conclusion of the tests, was: First FN, second EM-2, third M-1 and fourth T-25.

f. Test Officers' Opinion on General Handiness: The opinion of the test officers on general handiness and ease of operating, based on their observations during the test was: First EM-2, second FN, third M-1, and fourth T-25.

4. Analysis: handling the rifles was: First FN, second EM- T-25.

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Test No. 27:

1. Purpose: To determine whether or not the rifles are suitable as Sniper Rifles.

2. Method:

a. To evaluate the comparative long-range accuracy of the test weapons, the data obtained in Test No. 6, Phase I, for semi-automatic fire from a bench rest at 600, 800 and 1000 yards was studied.

b. Data in "a" above pertaining to the M-1 rifle was included in the study for control purposes since the M-1 rifle, when fitted with telescopic sight, is known to be satisfactory as a sniper's rifle.

c. The rifles were examined for feasibility of mounting telescopic sights; however, no sights actually were mounted.

3. Results:

a. The long-range accuracy of experts, taken from Test No. 6, Phase I, was as follows:

(Average Mean Radii in Feet)

Range	EM-2	FN	T-25	M-1
600	1.01	1.04	.77	1.04
800	1.43	1.61	1.06	1.40
1000	2.11	*Not Fired	1.56	2.13

Figure No. 1

*Sight designed to fire only to 600 yards. Local modification of sight made it possible to obtain data at 800 yards but not at 1000 yards.

b. The rifles were examined for feasibility of mounting telescopic sights. It was concluded that a telescopic sight could be mounted on all rifles:

(1) EM-2:

(a) The unit sight and cover could be removed and replaced by a telescopic sight and mount.

(b) The standard U. S. mount could be raised 3/32" and locking adapted to the existing dovetails on the receiver.

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(2) FN: A special breech cover could be manufactured to incorporate a base for the telescopic sight.

(3) T-25: The sight mount now used with the U.S. sniper's rifle M-1C could be mounted on the T-25. A cheek rest as currently used with the M-1C would be required.

4. Analysis:

a. There appears to be no major obstacle to mounting telescopic sights on any of the test rifles.

b. The accuracy of all the rifles tested, when delivering semi-automatic fire at long ranges, is sufficient to make them acceptable for sniping. The order of acceptability is as follows: T-25 first, EM-2, FN and M-1 about equal. (Due to the design of the sight, the FN could not be fired at 1000 yards).

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Test No. 28:

1. Purpose: To determine whether or not the bolt remains open after last round is expended from the magazine of the rifles and the action required to reload.

2. Method:

a. During all firing the action of the rifle on firing the last round was observed.

b. All failures of the bolt to remain open were recorded in the gun books.

c. The action required to ready the rifles for firing was noted.

3. Results:

a. FAILURES OF BOLT TO REMAIN OPEN

Rifle	Rounds Fired	Failures to Remain Open	Failures Per 1000 Rounds
EM-2	39,680	29	.75
FN	38,356	9	.23
T-25	58,177	69	1.18

Figure No. 1

b. (1) Action necessary to reload and fire after firing last round.

(a) EM-2:

1. Push forward magazine release and remove empty magazine.

2. Insert front of loaded magazine into feedway.

3. Rotate magazine into seat which releases bolt and carries a round into chamber. (From observation of all firing, this factor makes the EM-2 the simplest rifle to reload.)

4. Rifle ready to fire.

(b) FN:

1. Push magazine release forward and remove empty magazine.

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2. Place magazine in guides and push into feedway until seated.

3. Release bolt by pushing down on bolt release or pull operating handle to rear far enough to clear "bolt holding open device" and release operating handle.

4. Round is carried into chamber by either action and rifle is ready to fire.

(c) T-25:

1. Push magazine release to left and remove empty magazine.

2. Place magazine in feedway and push up until seated.

3. Rifle ready for Automatic fire.

4. Semi-Automatic fire: Pull trigger which releases bolt from "holding open device" and carries round into chamber ready to fire.

(2) Action necessary if bolt fails to remain open. If the "holding open device" failed to operate, it was necessary to pull back the operating handle, in the case of each rifle, before applying the above procedures for reloading.

4. Analysis:

a. In terms of failures of the bolt to remain open per 1000 rounds fired, the order of merit was FN, EM-2 and T-25.

b. With respect to simplicity of reloading, the EM-2 was best. with little choice between the FN and the T-25.

c. All rifles were satisfactory.

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Test No. 29:

1. Purpose: To determine the difficulty of assembling and disassembling the test rifles while wearing arctic hand gear.

2. Method:

a. The U. S. M-1 rifle was used as a control weapon.

b. Eight soldiers thoroughly familiar with the rifles participated in this test. (The Plan of Tests required that this test should be done by soldiers unfamiliar with the test rifles. Since soldiers familiar with the test rifles were used, the results should be evaluated accordingly.)

c. The soldiers were equipped with trigger finger inserts and Arctic Mittens (Standard Arctic Hand-gear).

d. Each soldier was required to field strip and assemble each test rifle and the M-1 rifle three times.

e. The procedure in field stripping and assembling used in Test 3 was repeated in this test.

f. The times for stripping and assembling were recorded.

g. All work was done at an ambient temperature of 88°F.

3. Results:

a. HM-2
(Time in Seconds)

	FIELD STRIPPING				::	ASSEMBLING			
Test Subjects	1	2	3	Average	::	1	2	3	Average
Coulas	15	15	13	14	::	37	41	22	33
Wilson	30	25	19	24	::	46	46	44	45
Paradis	32	23	24	26	::	32	48	44	43
McCoy	55	45	23	41	::	105	124	90	106
Moffatt	22	17	16	18	::	46	29	29	35
Christian	55	40	24	40	::	70	41	50	54
Paille	20	17	19	19	::	36	65	43	48
Cattral	34	21	23	26	::	62	37	66	55
Average				26	::				52

Figure No. 1

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FN
(Time in Seconds)

	FIELD STRIPPING				::	ASSEMBLING			
Test Subjects	1	2	3	Average	::	1	2	3	Average
Coulas	11	7	9	9	::	22	35	21	26
Wilson	15	21	9	15	::	34	25	20	26
Paradis	15	11	9	13	::	31	20	20	24
McCoy	25	12	14	17	::	25	29	30	28
Moffatt	14	27	14	18	::	25	28	18	24
Christian	21	23	13	19	::	35	50	62	49
Paille	13	11	11	12	::	27	25	23	25
Cattral	8	10	6	8	::	45	21	45	37
Average				14	::				30

Figure No. 2

M-1
(Time in Seconds)

	FIELD STRIPPING				::	ASSEMBLING			
Test Subjects	1	2	3	Average	::	1	2	3	Average
Coulas	10	15	20	15	::	40	24	45	36
Wilson	27	53	22	34	::	103	40	30	58
Paradis	40	29	27	32	::	65	46	30	47
McCoy	115	25	16	52	::	270	41	40	117
Moffatt	24	14	16	18	::	117	47	32	65
Christian	20	71	14	35	::	98	63	48	70
Paille	55	30	36	40	::	95	42	34	57
Cattral	33	24	19	25	::	110	115	60	95
Average				34	::				68

Figure No. 3

T-25
(Time in Seconds)

	FIELD STRIPPING				::	ASSEMBLING			
Test Subjects	1	2	3	Average	::	1	2	3	Average
Coulas	115	49	45	70	::	115	80	160	118
Wilson	105	71	85	87	::	150	79	70	100
Paradis	115	67	53	75	::	200	110	90	133
McCoy	125	145	85	118	::	257	285	152	231
Moffatt	70	53	53	59	::	162	138	138	146
Christian	340	64	63	158	::	340	157	105	201
Paille	190	57	51	99	::	190	270	157	206
Cattral	110	51	80	80	::	330	123	180	211
Average				93	::				168

Figure No. 4

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b. Unusual difficulties encountered were as follows:

(1) EM-2 - None

(2) FN - None

(3) M-1 - None

(4) T-25

(a) Disassembly: No specific difficulties were encountered in field stripping other than handling the numerous parts with mittens.

(b) Assembly: Considerable difficulty was encountered in aligning the holes in the semi-automatic and automatic control groups in order to seat the trigger group retaining pin.

4. Analysis: The T-25 was the most difficult to strip and assemble taking approximately 6 times as long as the easiest weapon, the FN; and over twice as long as the control weapon, the M-1. The order of ease was as follows: First - FN, Second - EM-2, Third - M-1, Fourth - T-25.

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Test No. 30

1. Purpose:

a. To determine the effect that Arctic Uniform has on the accurate delivery of fire by test personnel.

b. To determine the effect the Arctic Uniform has on the assumption of firing positions.

2. This test was omitted for the following reasons:

a. Insufficient time to conduct the firing as called for in "Plan of Test".

b. Extremely high temperatures encountered which made the wearing of the Arctic Uniform impracticable during extended periods of firing.

3. Sufficient information was obtained to determine that prescribed firing positions can be assumed when wearing the Arctic Uniform. (App.F-22)

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Test No. 31:

1. Purpose: To determine the comparative suitability of magazines.

2. Method:

a. Empty magazines and magazines loaded with 20 rounds were weighed and the weights recorded.

b. The ease of changing magazines was determined by questioning test personnel and by observing them change magazines during the conduct of firing tests.

c. During all firing a record was kept of malfunctions caused by faulty magazines.

d. Upon completion of all firing the magazines were inspected for serviceability.

3. Results:

a. Weights of empty and loaded magazines:

	Weight in Pounds	
Rifle	Empty	Loaded
EM-2	.52	1.45
FN	.47	1.40
T-25	.61	1.66

Figure No. 1

b. By observation and questioning of test personnel engaged in changing magazines, the following facts were determined:

(1) EM-2: No difficulty encountered in changing magazines. These magazines were the easiest to change. Lack of a magazine guide was noted.

(2) FN: Second easiest to change. Easier to change magazine when the rifle is tilted to the right. If the sling is used, the rifle must be taken off shoulder to change magazines. Lack of a magazine guide was noted.

(3) T-25: Most difficult to change. Magazine is easier to change when the rifle is tilted. Slightly difficult to remove magazine. Lack of a magazine guide was noted.

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(4) No great difficulty was encountered with any of the three weapons in changing magazines.

c. Malfunctions of, and damage to, magazines occurring during all firing were as follows:

MALFUNCTIONS AND DAMAGE

Type	No. Magazines Used	No. Rounds Fired	Unserviceable	Comments
EM-2	106	56,815	4	Damaged in use.
FN	84	54,800	1	Damaged in use.
T-25:				
Standard	56			3 Damaged in use.
X-Type	47	61,012	17	14 Short spring or set developed in spring.

Figure No. 2

d. None of the magazines of the three test rifles are expendable.

4. Analysis:

a. The EM-2 and FN magazines are satisfactory from the point of view of durability and ease of changing magazines. The T-25 standard and X-Type are unsatisfactory.

b. During the test it was not possible to determine what malfunctions of the rifles were due to the magazines.

c. The magazines of the EM-2 and T-25 are undesirably heavy.

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Test No. 32

1. Purpose: To compare the kick of the test rifles when firing test ammunition and grenades.

2. Method:

a. During the period covered by the tests, firers were observed and the manner in which they reacted to firing each type of rifle was noted.

b. Periodically firers were questioned about their reactions to the test rifles.

c. During the tests four questionnaires were answered by all firers. Each of these referred either directly or indirectly to kick.

d. Observations from the above three sources were used in assessing the comparative kick of the test weapons.

3. Results:

a. With Ball Ammunition:

(1) T-25: The kick was generally considered by most firers to be the most severe of all rifles fired, including the M-1. It also was held by some firers to be excessive and, in some cases, to cause discomfort and bruising.

(2) EM-2: The kick of this rifle, which is equipped with a rubber butt-pad, was generally considered by most firers to be the lightest.

(3) FN: The kick was considered by most firers to be a little more severe than that of the EM-2, but much less than the T-25.

b. When Firing Grenades: The severity of kick was generally considered by most firers to be as follows:

(1) M-1

(2) T-25

(3) FN

(4) EM-2

Though more sever than in firing ball ammunition, most firers considered the kick not excessive for this type of firing.

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4. Analysis:

a. The kick of the T-25 is the most severe of the test Rifles. The kick of the EM-2 is light and is the least of the three test rifles. The kick of the T-25 is excessive.

b. The kick of the EM-2 and the FN are considerably less than that of the M-1 and in neither case are they excessive.

c. The severity of the kick of the test rifles in launching grenades are not excessive for this type of firing.

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Test No. 33:

1. Purpose: To determine the comparative effect of firing test rifles on using personnel.

2. Method:

(a) During the firing of all tests the degree of fatigue of firers was noted.

(b) Firers were interviewed periodically on the effects of firing.

3. Results:

a. Effect of recoil and other functional operations on the firers: The kick of the test rifles has been compared in Test No. 32. No effect of the kick of the rifles was normally visible on firers until several hundred rounds had been fired. During an average day's firing, each firer used each type rifle to the same extent. Characteristics of the test rifles were as follows:

(1) T-25:

(a) Undesirably heavy kick. This resulted in bruised shoulders after firing.

(b) In automatic fire the rifle operates from either an open or a closed bolt. With the open bolt there were two undesirable effects:

1. A pressure of approximately 20 lbs. was required to operate the trigger. This called for an undesirable effort from the firer.

2. It required a greater effort to maintain a steady aim while the working parts were moving forward to fire the first round.

(c) By holding the rifle with the left hand too far to the rear and curling the fingers too far round the hand guard, the tips of the fingers could be pinched by the operating rod handle during its forward movement.

(d) The shape of the pistol grip and the stock behind the trigger guard caused soreness and abrasions to the skin over the the lower knuckle of the right thumb after an appreciable number of rounds had been fired.

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(2) FN: Heavy vibration of the butt on the cheekbone affected some firers.

(3) EM-2:

(a) The trigger pull was inconsistent requiring a greater degree of control and concentration from the firers than with the other test rifles.

(b) During rapid or sustained fire the trigger soon overheated and became too hot to be operated comfortably without some form of protection for the trigger finger.

(c) When they first fired the weapon several men thought that the sight might recoil and hit them on the forehead. Only one minor case of this occurred, but the fear remained until confidence had been gained.

(4) With all rifles in both semi-automatic and automatic fire at normal rates the forarm grip became too hot to hold after approximately 180 rounds.

b. Comfort of Firing Positions: Firing positions could be adopted equally well with all rifles except that the short stock of the FN handicapped tall men.

c. Effect of Shape of Stock:

(1) T-25:

(a) The comparatively sharp edges of the butt plate combined with its limited bearing surface made the recoil much more apparent to the firer, and, during sustained firing, caused bruising.

(2) FN:

(a) The butt of this rifle was too short, forceing most firers to adopt unnatural and uncomfortable positions.

(b) The foreend was too small in diameter. By encircling the rifle with his fingers a firer could interfer with his line of sight and also burn his fingers on the gas cylinder.

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(3) EM-2:

(a) The cheek rest heated up enough during rapid and sustained fire to become uncomfortable to some firers.

(b) The enlarged portion of the front grip was situated too far to the rear for comfort for the average man.

(c) When the barrel became hot, the screw thru the front grip conducted excessive heat to the firers hand.

d. Amount of Smoke, Dust and Gases Blown into Face:

(1) Smoke

(a) T-25: Smoke from the muzzle affected the maintenance of aim of some firers, during automatic fire.

(b) FN and EM-2: No adverse comments.

(2) Dust

(a) T-25: Dust was occasionally blown back into face when launching grenades.

(3) Gases:

(a) T-25: A strong blast of gases from the muzzle came back in firers' faces when launching grenades.

(b) FN: No adverse comments.

(c) EM-2: On ejection, unburnt particles of powder periodically struck firers on the face, producing a mild stinging effect. This sometimes irritates the eyes and nose.

e. Effect of Noise and Blast on Firer and the Effect of Rifles Adjacent to the Firer:

(1) T-25:

(a) Effect on Firer: No blast of gases was apparent except when firing grenades. However, the sharp report from the muzzle was a constant cause for complaint; and many firers reported partial deafness after firing.

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(b) Effect on Adjacent Firers: The sharp report caused considerable discomfort to the ears.

(2) FN and EM-2:

(a) Effect on Firers: None.

(b) Effect on Adjacent Firers: The angle of ejection was such that empty cases frequently struck firers to the right of the rifle fired up to a distance of 15 feet. This fault was more apparent with the EM-2 than with the FN.

f. Ease of Manual Operations:

(1) T-25:

(a) With the working parts to the rear, firing semi-automatic, the firer has to operate the trigger twice before he can fire the gun - the first time to close the bolt and the second time to fire the rifle.

(b) The effort required to fire the rifle from an open bolt (20 lbs trigger pull) was excessive.

(c) The magazine catch was badly positioned and difficult to operate, causing delay in changing magazines.

(d) The safety lever was badly positioned and hard to locate at night, causing delay in operation.

(e) Sight adjustment was stiff and slow.

(f) The operating handle became too hot to work during sustained fire.

(g) The majority of firers felt that this rifle was the least suitable of the test rifles in the ease of manual operations.

(2) FN:

(a) Of the three test rifles, this is the only one designed for manual operation with the left hand. This required practice by firers accustomed to right-handed

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operated guns, particularly in the prone position without bipod. With bipod, it appeared to be an advantage.

(b) The magazine release catch was hard to locate by touch. This causes delay in changing magazines.

(c) The ease of operation of the change lever was too variable.

(d) The majority of firers felt that this rifle was the most suitable of the test rifles in the case of manual operations.

(3) EM-2:

(a) The action of the trigger was inconsistent and lacks easily defined pressures.

(b) The trigger overheated after short periods of sustained fire.

(c) The cocking handle overheated in sustained fire.

(d) The initial unlocking, when the cocking handle was pulled to the rear was too stiff.

(e) The ease of changing magazines was noteworthy.

(f) The optical sight eliminated all manual operations required for sight adjustment.

(g) This rifle cannot be fired from the left shoulder.

(h) The majority of firers felt that this rifle was clearly inferior to the FN, but superior to the T-25, in the case of manual operations.

4. Analysis:

a. In comparative effect on using personnel the order of merit of the rifles is FN, EM-2 and T-25. The FN is clearly superior to the EM-2, and the EM-2 is clearly superior to the T-25.

b. The overheating factor in all three rifles is excessive and especially so the EM-2, in which the trigger also overheats. The acceptability of all rifles is marginal in this respect.

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c. The undesirably heavy kick and excessive blast of the T-25 makes its acceptability even more marginal.

Test No. 34:

1. Purpose: To determine the malfunctions and replacement of parts of test rifles and the causes therefor under the conditions encountered during tests.

2. Method:

a. During the firing of all user tests forty weapons were used, ten of each of the three test rifles and ten Cal. .30 M-1 rifles.

b. Throughout the firing of all tests a record or "gun book" was maintained on the range for each rifle showing:

(1) Number of rounds fired.

(2) Replacement of parts.

(3) Malfunctions or failures.

c. Throughout all firing test officers observed and examined the malfuctions and replacement parts on all weapons.

3. Results:

a. MALFUNCTIONS:

(1) The number of malfunctions that occurred with each type rifle is shown in Figure No. 1.

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SUMMARY OF MALFUNCTIONS - ALL RIFLES

Rifle Type	EM-3		FN		M-1	T-25	
Type Fire:	S/A	A	S/A	A	S/A	S/A	A
No. Rounds Fired:	20,064	36,751	19,923	34,877	16,684	22,739	38,273
Type Malfunction							
1. Failure to eject.	11	13	61	173	7	18	18
2. Failure to feed.	4	24	13	24	25	75	47
3. Failure to feed, bolt overriding top round	1	4	2	14	2	162	139
4. Failure to feed chamber empty.						5	
5. Failure to feed round not fully home.	20	22	16	17	3	39	10
6. Bolt failed to remain open.	27	25	1	7		42	26
7. Failure to extract.	2	1	11	9	8	47	13
8. Failure to fire round cap struck.	25	40	3	20	4	1	4
9. Failure to feed snubbed round.	1		3	3	5	11	8
10. Others	24	14	4	1	10		2
Total Malfunctions.	115	143	114	268	64	400	267
Malfunctions per 1000 rds. SA-A	5.73	3.89	5.72	7.68	3.84	17.63	6.97
Total Malfunctions All Firing	258		382		--	667	
Malfunctions per 1000 Rds fired	4.54		6.97		--	10.93	

Figure - 1

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(2) Causes: Only the more important items are discussed below. The causes are under investigation by the technical services.

(a) EM-2: Failure to fire round, cap struck (line 8).- Overcome to a large extent by fitting modified firing pin springs.

(b) FN: Failure to eject (line 1). - Possibly caused by fact that recoil is critical, although it probably can be corrected by minor modification.

(c) T-25: Failure to feed and and failure to feed with bolt overriding top round (line 2 and 3). - thought to be caused by the magazine; but a new type magazine only partially corrected it.

b. BREAKAGES AND PARTS REQUIRING REPLACEMENT.

(1) Breakages and replacemtns are listed in Figures No. 2, 3, 4 and 5.

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EM-2 Rifle

	Breakage or Part Requiring Replacement	No. of times occurred
1.	Firing spring replaced due to set	5
2.	Double firing pin springs fitted to all guns	10
3.	Broken locking levers	12
4.	Locking levers changed to oversized	18
5.	Broken sears	3
6.	Sear replaced (considered to be causing stoppages)	2
7.	Broken extractor	1
8.	Extractor lost during firing	1
9.	Extractor retaining pin replaced (one lost during firing)	3
10.	Sear sping replaced (not broken)	7
11.	Broken firing pin sleeve	2
12.	Broken front grip screw	4
13.	Broken sight screw	4
14.	Cover damaged (replaced)	1
15.	Broken piston	1
16.	Safety catch springs replaced (not broken)	4
17.	Front barrel bearing in front grip replaced	2
18.	Recoil spring replaced (bent)	1
19.	Firing Pin replaced (pitted radius)	3
20.	Broken piston catch	1
21.	Broken piston catch spring	1

Figure No. 2

FN

1.	Broken breech block slides	9
2.	Broken extractor springs	8
3.	Broken extractor	8
4.	Hand guard replaced	2
5.	Broken hammer	5
6.	Cracked hammer replaced	1
7.	Washer fitted to holding open device screw	6
8.	Broken change lever	2
9.	Cracked butt (replaced)	2
10.	Broken return spring tube	1

Figure No. 3

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M-1 Rifle

	Breakage or Part Requiring Replacement	No. of times occurred
1.	Changed clip ejector spring	1
2.	Trigger housing group replaced	1
3.	Front hand guard charred and burnt badly, split and replaced	1
4.	Elevating screw and knob came off during firing and replaced	1
5.	Changed rear sights	2
6.	Follower rod worn out and replaced	1
7.	Cracked piston head, weak operating rod spring replaced	1

Figure No. 4

T-25 Rifle

1.	Broken front firing pin	19
2.	Broken rear firing pin	4
3.	Gas plug broken (in attempting to remove)	2
4.	Trigger housing lug broken	4
5.	Hammer pin slipped from seat	2
6.	Operating rod slide broken	2
7.	Broken Stock	5
8.	Hand guard split	3
9.	Locking lug broken (in removal)	3
10.	Replaced fire control unit	1
11.	Extractor broken	2
12.	Front swivel assembly broken	1
13.	Gas cylinder plug replaced	3
14.	Operating rod spring replaced	4
15.	Breech lock replaced	1
16.	Piston replaced (4 sided for 6 sided)	8
17.	Extractor plunger spring replaced	1
18.	Replaced selector cam	2

Figure No. 5

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(2) Causes: Only the more important items are discussed below; the causes are under investigation by the technical services.

(a) EM-2:

1. Firing spring replaced and double firing springs fitted to all guns (lines 1 and 2). - Springs shortened in length after moderate amount of firing, contributing to light strikes. Later all guns were fitted with new design double springs.

2. Broken locking levers and locking levers changed to oversized (lines 3 and 4) - Probable cause was strain due to wear in the locking lever recesses in the body. Oversized locking levers were fitted when headspace became excessive.

3. Safety catch springs replaced (line 16) - The springs had lost their tension permitting vibration of the gun to work the safety off "safe."

(b) FN:

1. Broken breech block slides (line 1) - Caused by changing the metal used in spare slides. When a new supply, made of the original metal, was received, the breakages ceased.

2. Broken extractors and extractor springs (lines 2 & 3 - Possibly faulty heat treatment. Each time extractor broke, spring broke with it.

3. Broken and cracked hammers (lines 5 & 6) - Cause unknown. The hammer has been redesigned to overcome this.

4. Broken return spring tube (line 10) - Caused by hard usage in bayonet fighting test.

(c) T-25:

1. Broken front and rear firing pins (lines 1 & 2)- Cause unknown. Several types tried without correcting breakage.

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2. Broken trigger housing lug (line 4) - Appeared to be caused by vibration of firing. Replacement of complete trigger housing required in each case.

3. Broken stock (line 7). The stock is too weak at the rear of the receiver well.

(d) For details see Figures No. 6 through 9.

4. Analysis:

a. The order of merit based on stoppages per 1000 rounds in all firing is EM-2 (4.54), FN (6.97) and the T-25 (10.93).

b. The order of merit in total number of breakages and parts requiring replacement is M-1 (8), FN (44), T-25 (67) and EM-2 (86).

c. None of the test weapons is at present as reliable as the M-1, but as development weapons the malfunctions are not considered excessive.

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MALFUNCTIONS - EM-2 Rifles

Rifle Number:	#1		#2		#3		#4		#5	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	2107	4078	2296	4973	169	1006	3116	4875	2716	7332
Type of Malfunctions										
Failure to eject.						1	3		7	7
Failure to feed.		1		3			3	7		2
Failure to feed bolt overriding top round.						1		2	1	
Failure to feed chamber empty.										
Failure to feed round not fully home.	1	1	4			2	8	4	3	4
Bolt failed to remain open.	3	2	5	7				9	14	3
Failure to extract.									2	
Failure to fire round cap struck.		6	9			2	1	1	9	8
Failure to feed snubbed round.							1			
Others.	3	1	3			3	1	1	6	2
Total Malfunctions all types.	7	11	21	10		9	17	24	42	26
Total Malfunctions S/A & A Fire	18		31		9		41		68	

Rifle Number:	#6		#7		#8		#9		#10	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	794	2926	416	91	3720	5688	2723	2139	2007	3643
Type of Malfunctions										
Failure to eject.		3			1	1				1
Failure to feed.		1			1	5		2		3
Failure to feed bolt overriding top round		1								
Failure to feed chamber empty.										
Failure to feed round not fully home.		5		1	2	2	2	1		2
Bolt failed to remain open		1			3		1		1	3
Failure to extract.		1								
Failure to fire round cap struck.		1			4	14	1	5	1	3
Failure to feed snubbed round										
Others.	1				7	3	2	1	1	3
Total Malfunctions all types	1	13		1	18	25	6	10	3	15
Total Malfunctions S/A & A Fire	14		1		43		16		18	

Figure No. 6

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MALFUNCTIONS - FN Rifles

Rifle Number:	#11		#12		#13		#14		#15	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	3186	4416	434	148	1645	2760	2691	2355	2375	3406
Type of Malfunctions										
Failure to eject.	23	15	1			6	8	26	11	14
Failure to feed.	4	11			1	2			2	
Failure to feed bolt overriding top round	1		1			3		1		
Failure to feed chamber empty.										
Failure to feed round not fully home.		2			1		2	2	3	
Bolt failed to remain open.	1									
Failure to extract.	8	1				1	1		1	
Failure to fire round cap struck.		2						3		
Failure to feed snubbed round.		2								
Others.	1	1	1						1	
Total Malfunctions all types	38	34	3		2	12	11	32	18	14
Total Malfunctions S/A & A Fire	72		3		14		43		32	

Rifle Number:	#16		#17		#18		#19		#20	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	1594	4299	2246	3816	3048	4549	1894	3749	810	5469
Type of Malfunctions										
Failure to eject.	3	14	6	12	6	57	2	12	2	17
Failure to feed.		2	3	4	2	2	1	1		2
Failure to feed bolt overriding top round		4				3		1		2
Failure to feed chamber empty.										
Failure to feed round not fully home		1	7	10	1	1		1	2	
Bolt failed to remain open.		4				3				
Failure to extract		5	1					1		1
Failure to fire round cap struck			2	6		3	1	3		3
Failure to feed snubbed round.					1	1			2	
Others.							1			
Total Malfunctions all types	3	30	19	32	10	70	5	19	6	25
Total Malfunctions S/A & A Fire	33		51		80		24		31	

Figure No. 7

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MALFUNCTIONS - M-1 Rifles

Rifle Number:	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
No. Rounds Fired:	1463	1723	1481	2308	1665	2054	2336	1179	1263	1212
Type of Malfunctions										
Failure to eject.				4		1	1			
Failure to feed.	7	8		6	1		2		1	
Failure to feed bolt overriding top round						1				
Failure to feed chamber empty.										
Failure to feed round not fully home.						1	1			
Bolt failed to remain open										
Failure to extract.	2			2			3			1
Failure to fire round cap struck.		1						2	1	
Failure to feed snubbed round					2			1	1	1
Others.	1	3			1		3	1		1
Total Malfunctions all types	10	12	0	12	4	3	10	4	3	3

Figure No. 8

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MALFUNCTIONS -T-25 Rifles

Rifle Number	#31		#32		#33		#34		#35	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	3990	None	585	7725	4941	4185	3876	4168	1730	4217
Type of Malfunctions:										
Failure to eject.			10		1	1	1	4	3	3
Failure to feed.	17		10	2	14	3	2	3	12	4
Failure to feed bolt overriding top round	41		12	11	20	1	6	13	35	39
Failure to feed chamber empty.	3									
Failure to feed round not fully home.	11		1	2	6		20	1		2
Bolt failed to remain open.	13		4	4	5	2	1	1	7	3
Failure to extract.	25		1				2		5	3
Failure to fire round cap struck.				1			1			3
Failure to feed snubbed round.	2		2			1	1	1	1	3
Others.				2						
Total Malfunctions all types	112		40	22	46	8	34	23	63	60
Total Malfunctions S/A & A Fire	112		62		54		57		123	

Rifle Number:	#36		#37		#38		#39		#40	
Type Fire:	S/A	A	S/A	A	S/A	A	S/A	A	S/A	A
No. Rounds Fired:	1408	4040	1482	3613	1433	3945	681	2731	2613	3650
Type of Malfunctions										
Failure to eject.	2	2	1	1				4		3
Failure to feed	9	5	5	8	1	15	1	2	4	5
Failure to feed bolt overriding top round	23	20	8	18	3	17	2	12	12	18
Failure to feed chamber empty.									2	
Failure to feed round not fully home.			1	3				1		1
Bolt failed to remain open.	7	8	1	1	1	1	3	5		1
Failure to extract.	4		3		4		3	9		1
Failure to fire round cap struck.										
Failure to feed snubbed round.	1		2			1			2	2
Others.										
Total Malfunctions all types	46	35	21	31	9	34	9	33	20	31
Total Malfunctions S/A & A Fire	81		52		43		42		51	

Figure No. 9

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Test No. 35:

1. Purpose: To determine wherein the tested rifles meet and/or fail to meet the established military characteristics for lightweight rifles.

2. Method:

A study and comparison of the results of the rifle tests and the Military Characteristics established by Army Field Forces Board No. 3 Project 2231 and Appendix "B" to British War Office Policy Statement No. 9 were made.

3. Results:

The results of comparison and study are tabulated in Inclosure 1.

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
1. Purpose: To produce a lightweight rifle suitable for filling its place in a family of weapons that includes a lightweight machine gun firing the same round of ammunition.	1. Object: To produce a rifle capable of:					
	a. A high rate of single shot aimed fire (30 rds per min.)	10	Rounds per min. - 31.2 -	Rounds per min. -41.4 -	Rounds per min. - 43.2--	Rounds per m - 42.4 -
	b. Bursts of fully automatic fire with reasonable accuracy. See Paragraph 5.	7 - 8	None.	None.	None.	None.
[illegible]neral: Replace the M-1 [illegible]nd carbine; satisfy [illegible]ryman's requirement for:	2. General:					
[illegible]. Large volume of fire.		10	31.2 rounds per minute - semi-automatic.	41.4 rounds per minute - semi-automatic. 85 rounds per min.-automatic.	43.2 rounds per minute - semi-automatic. 65 rounds per min.-automatic.	42.4 rounds minute - sem automatic. 80.2 rounds min.-automat
[illegible]. With telescopic sight, [illegible]s the sniper's rifle.		27	When provided with telescopic sight and cheek rest, this rifle is M-1C sniper's rifle.	Adaptable to mount a telescopic sight. Accuracy at long range equals M-1.	Adaptable to mount a telescopic sight. Accuracy equals M-1 (not tested beyond 600 yds)	Adaptable to mount a tele copic sight Accuracy at long range exceed M-1.
c. With heavy duty barrel and bipod, replace the BAR.		7 & 12 App B	T-25 heavy barrel is 27% more accurate in Automatic Fire than th best of the test rifles, but is 16% less accurate than the Bren and 8% less accurate than the BAR. EM-2 and FN can maintain ra of 60 rounds per minute in automatic fire. T-25 cannot. All rifles became too hot to hold after 180 rounds.			
	The rifle: be simple, strong, compact and well balanced - handy and convenient for carrying.	26	Third easiest rifle to handle.	Second easiest rifle to handle.	Easiest rifle to handle.	Fourth easi rifle to ha

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

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			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
3. Ammunition: See Military haracteristics for Small Arms mmunition (Ammunition Test #11)	3. Ammunition: See App. M to Policy Statement No. 9.	App. B	Caliber .30 Ball Length - 3.34" Weight- 396 Grs. AP, API, Tracer.	Caliber .280 Ball Length - 2.53" Weight- 322 Grs. AP, API, Tracer, Observing.	Same as EM-2.	Caliber .30 Ba Length - 2.78 Weight- 364 G AP, API, Trac Observing.
4. Performance:	4. Performance:	10,11 and 12	See Par.2 Col.1	Same.	Same.	Same.
a. Sustained Fire: (1) Semi-automatic: The hall produce the greatest e sustained rate of semi- ic fire and in no event t be less than now d by the M-1 rifle.		10,11 and 12	All test rifles can maintain a rate of 15rds. per min. for 30 min w/out damage to the weapons, while the EM-2 and FN can maintain a rate of 20 rds. per min. with only minor charring. At this rate t T-25 hand guard burned and became separated from the rifle. The most effective rate of semi-automatic fire is 20 rds. per min. fo 15 mins., however, rifles are too hot to hold after about 180 rds have been fired.			
(2) Automatic: Automatic ed fire 100 per minute ins. in 2 - 3 round bursts.		10,11 and 12	All test rifles can maintain a sustained rate of fire of 40 rds.p min. for 5 mins. The EM-2 and FN can maintain 60 rds. per min. fo mins.with only minor charring. The T-25 stock burst into flames attempting to maintain this rate. The most effective rate of auto fire is 40 rds. per min. for 5 mins., however, rifles became too to hold at from 120 to 150 rounds.			
b. Grenade Launcher: Shall e capable of launching a standard renade to ranges now obtained by -1 rifle. (Temp. Range - 65° to 125°F.		17	Accuracy of M-1 and test rifles approximately equal.			
		14	Maximum range - 774'	Maximum range - 623'	Maximum range - 728'	Maximum range 809'
c. Ruggedness and Durability: hall be rugged and durable enough o withstand continual hard usage ith minimum maintenance.		34	Minimum maintenance test not conducted. Breakage in hard usage - rifles satisfactory and equal. Ability to fire after hard usage: FN and T-25 unacceptable and EM-2 marginal. Breakage all test order of merit - FN, T-25, EM-2. Stoppages all tests order of merit - EM-2, FN, T-25.			

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-2
1	2	3	4	5	6	7
d. Temperature Requirements: Operate from -65 to 125°F without special kits, lubricants or other accessories.		Aber-deen Rpt.		Functioned satisfactorily at -65 to 125°. Special lubri-cant required.	Functioned satisfactorily at 125°but at 65°special lubri- cant required.	Function satisfac at 125° not 65°
	a. Capable of penetrating body armor, helmets, clothing and equipment to 600 yards and causing incapacitating wound.	Aber-deen Rpt.	Sixty percent penetration of body armor to 1000 yards. One hundred percent helmet penetration to 1200 yards. Penetration of 10 gauge mild steel plate sufficient to satisfy this requirement.			
	b. Effective as possible against soft skinned vehicles and personnel therein.					
5. Accuracy:	5. Accuracy: In hands of trained soldier.					
a. Semi-automatic: From st all shots within a 20" rcle at 600 yards.		6	All shots in 45" circle.	All shots in 44" circle.	All shots in 45" circle.	All shot 33" circ
b. Automatic: (1) With Rest: All shots of 2 - 3 round burst in 24" circle at 200 yards.		7	None.	All shots in 74" circle.	All shots in 54" circle.	All shot 66" circ
(2) Without Rest: 5 round burst in 24" circle at 50 yards standing w/o support.		8		Unable to catch sufficient rounds to recor group on a 6 ft. x 10 ft. target.		
	a. Single Shot: 5 rounds in 6" group at 200 yards.	6	All shots in 17" circle.	All shots in 15" circle.	All shots in 15" circle.	All shot 11" circ
	b. Automatic: 60% of shots fired in 2 - 3 round bursts in 24" x 24" target at 50 yards, standing without support.	8	None.	61% of shots fired caught on a 6' x 10' target.	67% of shots fired caught on 6' x 10' target.	68% of s fired ca on 6' x target.

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T
1	2	3	4	5	6	
6. Sights: a. Adjustment: Simple design easy to operate for range and windage with or without Arctic Mittens.	6. Sights: Development of optical and iron sights required.	5	Sight is adjustable by easily operable windage and elevation knobs.	This rifle was provided with an optical sight of unit magnification. Its reticle was graduated in 200 yd. increments for odd hundreds of yds to 900 yds.	Sight was adjustable in 100 yard increments to 600 yards by slide & ramp principle.	Sight to 800 yd inc minute click by sle
b. Graduations easy for irer to see with least possible ead movement: Elevation in 100 ard steps to 400 yards; 50 ard steps to 600 yards and 25 ard steps to 800 yards.	Graduations to 600 yards in 100 yard steps: Intermediate graduations to 50 yards, it is desirable that 25 yard adjustments be provided.	5	Elevation graduations in 100 yd. increments and windage in 5 mins. are easily read. Adjustment in one minute of angle clicks.	Lateral adjustment was accomplished by hold off.	Lateral adjustment was accomplished by hold off.	Latera ment a by one angle Latera in 5 m
c. A battle sight adjustment hall be provided.	a. Battle sight adjustment effective to 300 yards shall be provided.		None.	Sight principle easily adaptable to battle sight.	None.	None.
	b. Provision for fitting a night sight device shall be provided. (WOPS #6 SD 7a).	App. B	None.	None.	None.	None. foldi provid type able.

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-65
1	2	3	4	5	6	7
7. Weight: The rifle shall be as light as possible and shall not exceed 7 lbs. without sling, magazine and other accessories.	7. The weight of the weapon without magazine and bayonet shall not exceed 8 lbs. It is desirable that it be lighter if possible.	App. B	9.73 Pounds.	8.03 Pounds.	8.57 Pounds.	7.88 Poun
8. Accessories:	8. Accessories: A sling shall be provided for carrying rifle and to assist in firing from shoulder and hip.	24	Leather sling Weight - .5 lbs. Suitable but heavy and complicated.	Sling provided unsatisfactory.	Same as EM-2.	Same as M
a. A sling for carrying firing support.						
b. Cleaning Kit containing ssary equipment for field tenance.		4	Cleaning kit with rod, brush, oil and combination tool fits into stock.	Kit similar to M-1 kit required. None furnished for test.	Same as EM-2.	Same as E
c. Bayonet: A knife-like net.	a. Blade bayonet of No.5 type will be provided.	13½ 14	Weight -.96 lbs.	Weight -.79 lbs. No. 5 type.	Weight .67 lbs. No. 5 type.	Wt. .62 l Bayonet b Bayonet u factory f durabilit
d. Recoil check, stabilizer, grenade launcher, and flash hider if required. All required items in a single combination if practical. If not, then as many as practical into single attachment.	b. Grenade Launcher: A spigot type grenade launcher with special rounds are acceptable.	13½	Grenade launcher (spigot type) is standard for weapon. Flash hider funnel shape also standard. Two items are not in combination.	Grenade launcher similar to U.S. standard furnished. No flash hider or other items furnished for test.	Grenade launcher similar to U.S. standard furnished for test. Flash hider recoil check also furnished but no items in combination.	Stabilize integral rifle. St grenade l adapted f over this lizer. No hider was vided.

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATIONS FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
	c. Bipod: Provisions for fitting a detachable forward bipod should be made.	App.B	None	Wt. .70 lbs. - Affixable to lugs just forward of handguard.	Wt. .57 lbs.- Affixable to lugs just forward of handguard.	Wt. .8 Affixa bayone Bayone Grenad cause able c C.I. grenad provid
	d. Provisions should be made in basic design for fitting Arctic equipment.	App.B	Tests have been conducted on a trigger adaptable without changing basic design.	Trigger is provided that can be fitted without changing basic design.	Same as EM-2.	No tri vided/b simila could
9. Action: a. Field Stripping shall be easily accomplished in the field without the use of a special tool.	9. Action: a. (Part) Replacement and cleaning of parts accomplished without the use of tools.	3 4	Combination tool required for field stripping. Second easiest to field strip.	Combination tool not required for field stripping but for cleaning and replacement of parts. Third easiest to field strip.	Cartridge only required for field stripping. Easiest of all rifles to field strip.	Combin requir field Unsati to fie becaus cated
b. Semi-automatic-Automatic Fire controlled by an easily accessible and easily operable change lever. Automatic fire group easily removable without impairing semi-automatic functioning.	c. Automatic fire prevented semi-permanent part capable of being replaced by unit Armorer but not the soldier in the field.	App.B	No automatic fire.	Replacement of change lever with one designed for semi-automatic fire only would eliminate Auto. fire w/out impairing semi-auto. capability. Could be replaced by any soldier.	Same as EM-2.	Design and Au contro remova soldie impair automa ing.

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT No. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
	b. Trigger must provide optional single shot or automatic. Trigger must have two pressures - same as existing rifle.	App.B	No automatic fire.	Requirements met except that trigger pressu heavier than existing British rifle.		
c. Minimum Maintenance: Rifle require minimum aintenance and be capable f firing long period with- ut cleaning or lubrication.	d.(Part) Free of risk of stoppage from fouling from long continued firing.	34	Minimum maintenance test not conducted. Rifles requ attention during tests.			
d. Manual Safety: Positive, asily identifiable shall be rovided.	e. A Manually Applied Safety must make the weapon fully safe.	16	Manual safety prevents dis-engagement of sear.	Manual safety Locks sear.	Manual safety locks trigger.	Manual locks
e. Integral Safeties shall e provided to prevent angerous malfunction.	d. Action must be mechanically safe.	16	Has one safety feature that prevents rifle from being fired before action is fully housed and locked.	Has two features that prevent firing until bolt is fully housed and locked.	Same as EM-2.	Has th that p firing is com ward a
f. Prefiring Movement of Parts: No Prefiring movement parts in Semi-automatic fire. It is desirable that there be none in Automatic fire.	f. Semi-automatic fire must be from a closed bolt.	App.B	Fires Semi-automatic from closed bolt.	Fires both Semi-automatic and Automatic from closed bolt.	Same as EM-2.	Fires automa closed Automa open b pull e open b

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHEWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 -SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
g. Recoil as light as possible consistent with other characteristics and not greater than the M-1 rifle.	g. No danger of cook off due to overheating in automatic fire.	32	Lighter kick than T-25 but not as light as EM-2 or FN	Lightest kick of tested rifles.	Second lightest kick of tested rifles.	Sharpest k the four r and is exc
h. Blast to a minimum, back and side shall be avoided.		33	No objectionable blast.	No objectionable blast but occasional particles of unburned powder strike firer in the face.	No objectionable blast.	Objectiona side and b blast affe firers and
lt Open: The bolt shall open after the last is fired from a magazine.	h. Bolt Open shall remain open on the firing of the last round of a magazine, holding open device manually operated to permit re-charging of partially empty magazine.	28	Yes. Cannot recharge except by ejecting unexpended rounds & replacing complete clip.	Bolts remain open on last round. No means provided for recharging magazine in the rifle.	Holding open device can be operated to recharge magazine in rifle.	Same as EM
	i. Ejection shall be forward and below horizontal.	33	Ejection is above horizontal to the right front.	Ejection below horizontal but is to flank frequently striking adjacent firers to 15 feet.	Strikes adjacent firers to 10 feet.	Ejection i and to the right fron
	h. Rifle must be capable of manual shot operation if mechanism fails.	App.B	Operating handle permits this operation.	Same.	Same.	Same.
	k. Rifle must be easily loaded with single rounds for grenade launching.		Single round can be easily loaded.	Same.	Same.	Same.

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U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-25
1	2	3	4	5	6	7
	a.(Part) Mechanism protected from sand, water and dirt, and free from risk of derangement due to hard usage.	App.B Test 17½	In closed bolt position mechanism is protected but not in open bolt.	A cover is provided over ejection way and over working parts to protect mechanism against water,etc. Marginal performance after exposure to dust and water.	A cover is over working parts but ejection way is open. Unsatisfactory in firing after exposed to dust and water.	Same as Unsatisf in firin exposed and wate
	a.(Part) Firer must be protected from hot metal.	App.B.		Trigger requires insulation.	Forward hand guards provi	
10. Feed: Magazine feed by magazine as small and compact possible holding not less an 20 rounds. Rechargeable or out of the rifle.	16. Feed by magazine or other device containing not less than 20 rounds. Conventional magazine should be rechargeable by clips or chargers. Charging or changing accomplished with ease by day or by night in all weather. Magazines must be interchangeable. An expendable feed device is desirable.	31	Fed from the top by 8 round clip.	Magazines of T-25 and EM-2 are undesirably h Magazine fed by 20 round magazine underneath. Magazine is not easily rechargeable in the rifle. However, Magazines are easily changeable in light or dark. Magazines are interchangeable. Magazines are not expendable. Easiest rifle to change magazine.	Same as EM-2. 2nd easiest to change magazine	Same as Hardest change m zine and unsatisf

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TEST NO. 35 - COMPARISON OF RESULTS OF TEST OF LIGHTWEIGHT RIFLES WITH ESTABLISHED MILITARY CHARACTERISTICS

U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 - SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T-2
1	2	3	4	5	6	7
11. Rate of Fire:	17. Rate of Fire:					
a. Semi-automatic shall deliver the maximum possible number of aimed shots by trained soldiers.		11	31.2 RPM	41.4 RPM	43.2 RPM	42.4
b. Automatic: The cyclic rate shall not be so great as to compromize accuracy or adversely ability to fire 2 - round bursts.	The cyclic rate shall be between 300 and 700 rounds per minute.	Aber-deen Rpt. App. B-1	None	625	575	87
12. Adaptability: The rifle with minor modifications shall be capable of replacing all individual small arms shoulder-fired.	18. Portability and Parachuting:	36	Rifles when development completed will be capable of replaci sub-machine guns, carbine and rifles but not the light autom of the Bren and BAR class.			
a. Size: As short and compact as possible but not so short as to prohibit assumption of normal prone position or severely handicap a soldiers ability to destroy the enemy with a bayonet.		App. B	Length 43.5".	Length 34.62".	Length 38.75".	Length 4
		15	All firing positions can be assumed.	Same.	Same.	Same.
		14	Bayonet can be used.	Same.	Same.	Same.
b. Shape: It shall be usable by all persons that meet military requirements of A.F.F. right and left handed.		15	All types individuals tested could assume satisfactory firing positions.	Same, except cannot be fired from the left shoulder.	Same as M-1.	Same as
c. Airborne Use: It shall be capable of withstanding parachute drop on the soldier and air drop in air drop.	a. The rifle and its ammunition shall be capable of being carried by a parachutist during jumping. It is desirable for this purpose the rifle be no longer than 40" providing this does not impair performance in any way.	22	Acceptable in shape and form for parachutists durable enough to withstand drop. Length is 43.5"	Same as M-1 except it was not tested for durability in withstanding drop with parachutist.	Same as EM-2.	Same as

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U. S. MILITARY CHARACTERISTICS FOR A LIGHTWEIGHT RIFLE PROJECT NO. 2227	BRITISH APPENDIX "B" TO POLICY STATEMENT NO. 9 -SPECIFICATION FOR A NEW AUTOMATIC RIFLE	TEST OR REF. NO.	RIFLES PERFORMANCE RECORD RESULTING FROM TESTS			
			M-1	EM-2	FN	T
1	2	3	4	5	6	
	b. For Air supply purposes, it is essential that rifles and ammunition in service containers can be easily packed, and dropped by air.	—	Lower case NOT TESTED	Same.	Same.	Same.
d. Mechanized Use: It shall be adaptable for use by tank crewmen and armored infantry.		23		Adaptable for use by Armored Infantrymen and Tank crewmen 1st preference.	Same as EM-2. 2nd preference.	Adapt use b men a Infar Short is de 3rd p
e. Arctic Use: All operations necessary for firing must be able to be performed with trigger finger mittens and with kit, complete arctic handgear.		29	Meets requirements except no kit provided with T-25.			
f. Balance: The rifle shall be so balanced as to be easily pointed and aimed.	Paragraph 2	25	3rd easiest of rifles to handle.	2nd easiest of rifles to handle.	Easiest of rifles to handle.	4th rifl hand
g. Firing Fatigue: The shape, dimensions and balistics shall combine to permit sustained firing from all conventional positions without fatigue.		33	Of the items listed, this rifle causes 3rd least discomfort to firers.	Of the combination of items listed, this rifle causes the 2nd least discomfort to firers.	Of the combination of items listed, this rifle causes the least discomfort to firers.	Of t list rifl the comf fire
			All the rifles can be fired from all conventional posit without undue fatigue.			

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Test No. 36

1. Purpose: Assuming the test rifles are satisfactory for adoption as rifles, to determine their suitability also to replace the U. S. Carbine, sub-machine gun, and automatic rifle and the U.K. Sten and Bren guns.

2. Method: The results of the rifle test were compared with the results of earlier tests of the standard U.S. weapons and with data taken from field manuals and technical manuals. For the purpose of the study it was assumed that the U.K. weapons are generally similar in performance to the U.S. standard weapons. Where they are deemed suitable to replace U.S. weapons, they are assumed to be suitable to replace comparable U.K. weapons.

3. Results:

a. Suitability of the Test Rifles to Replace the Carbine:

(1) The carbine originally was designed to replace the pistol to afford increased protection and fire power to personnel whose primary duties are other than fighting. Its essential characteristics are its light weight, both in the weapon and in the ammunition load, and its handiness for carrying.

The carbine has been modified over a period of years by the addition of an automatic fire feature, a bayonet, and a grenade launcher. These modifications place the carbine additionally in the class of sub-machine gun and rifle. (Final Report of Infantry Board No. 1644-B, 26 Aug 44)

(2)

	Carbine	EM-2	FN	T-25
Weight (pounds)	5.25	8.03	8.57	7.88
Length (inches)	35.5	34.4	38.75	43.0

Weight of loaded magazine:

Carbine	Test Weapons
30 rounds - 1.0 pounds	20 rounds - 1.5 pounds (approx)

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Figure No. 1

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(3) Accuracy in Automatic Fire within the effective range of the carbine the automatic fire accuracy of the carbine and the test rifles is generally equal: (Inf. Board Report 1644-B and Test No. 8.)

Carbine

100 Yards - 3 & 4 Rd. Bursts - 12' x 12' panel - Percent of Hits:

Prone	84
Standing	53

Test Rifles

50 yards - 2 & 3 round bursts - 6' x 10' panel:

	EM-2	FN	T-25
Prone (Max. Spread)	3.12	2.35	4.10
Standing (% of hits)	49	63	78

Figure No. 2

b. Suitability of the Test Rifles to Replace the U.S. Sub-machine Gun M3A1 and U.K. Sten Gun:

(1) In World War II the sub-machine gun was used by U.S. infantry as a defensive and close combat weapon by squad leaders and platoon leaders and for special combat roles such as house fighting and night patrolling. In the Armored units it was used by tank crews for close-in defense and when they were forced to abandon vehicles. The sub-machine gun presently is standard only for tank crews, both Infantry and Armor. The British army, however, retains the requirement for the sub-machine gun (Sten) as an infantry defensive and close combat weapon.

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(2)

	SMG	EM-2	FN	T-25
Weight (lbs)	7.87	8.03	8.57	7.88
Length (ins)	29.2	34.4	38.75	43.0
Stock Folded	22.2	----	-----	-----

Weight of SMG 30 Rd Magazine Loaded - 2.08 lbs.

Figure No. 3

(3) Accuracy in Automatic Fire: At the close ranges at which sub-machine guns normally are fired, the accuracy of the U.S. sub-machine M3A1 and of the test rifles is generally equal: (Inf. Board Report 1792 and Test No. 8).

SMG M3A1

1000" - 3 & 5 Round Bursts - Standing

Maximum Spread 49"

100 Yds. - 3 & 5 Round Bursts - Standing - 6' x 6' panel

Percent of hits - 47

Test Rifles

25 Yds. - 2 & 3 Round Bursts - Standing

	EM-2	FN	T-25
Max. Spread (Inches)	44"	37"	35"

50 Yds. - 2 & 3 Round Bursts - Standing - 6' x 10' panel

	EM-2	FN	T-25
Percent of Hits	49	63	78

Figure No. 4

(4) Suitability for Armored Use: All of the test rifles are suitable for armored use in the order of preference EM-2, FN, T-25. The preference is based mainly on ease of stowage in, and firing from, armored vehicles. (Test No. 23)

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c. Suitability of the Test Rifles to Replace the U. S. BAR and the U.K. Bren Gun:

(1) The BAR was developed to bring within the rifle squad as much of the accuracy, range, and sustained automatic fire power of the light machine gun as possible in a weapon fully transportable and operable by one man. In World War II it was standard within the infantry rifle squad, as it is today. The British make similar use of the Bren gun.

(2)

	BAR	EM-2	FN	T-25
Weight (pounds)	20	8.03	8.57	7.88
Length (inches)	48	34.4	38.75	43.0
Wt. of 20 Round Magazine	1.62	1.45	1.40	1.66
Cyclic Rate	350 & 550	625	575	875

Figure No. 5

(3) Accuracy in Automatic Fire: (Test No. 8)

(a) At the limited ranges tested (100 and 200 yards), the BAR was approximately twice as accurate as the test rifles. The T-25 with heavy barrel (the only test rifle so equipped) was 25 to 30% more accurate than the test rifles but was considerably less accurate than the BAR.

(4) Maximum Sustained Rate and Most Effective Rate: (Tests No. 11 and 12)
The maximum sustained rate and the most effective rate of the test rifles is the same - 40 to 60 rounds per minute for 5 minutes, provided the hands are protected. The maximum sustained rate of the BAR is 40 - 60 rounds per minute indefinitely, and its most effective rate is 120 - 150 rounds per minute. The effective and sustained rates of the T-25 with heavy barrel were not tested.

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4. Analysis:

a. Any of the test rifles when modified in accordance with Appendix "E" could replace the carbine.

b. (1) Any of the test rifles when modified in accordance with Appendix "E" is satisfactory to replace the U.S. sub-machine gun M3A1 and the U.K. Sten gun as armament for crews of armored vehicles in the order of preference EM-2, FN, T-25.

(2) Considered as a close combat weapon for general infantry use, the order of preference (based primarily on length) would be, again, EM-2, FN, T-25.

c. In their present development, because of insufficient automatic fire accuracy and insufficient sustained fire capability, none of the test weapons is capable of replaceing the U.S. BAR or the U.K. Bren gun. Limited tests indicate that the T-25 with heavy barrel (the only test weapon so equipped) has insufficient accuracy in automatic fire to replace the BAR or Bren guns. Its sustained fire capability was not tested.

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Ammunition Test No. 1:

1. Purpose: To determine the comparative accuracy of test ammunition.

2. Method:

Suitable comparison of ammunition could not be made at this Board. The accuracy was determined at Aberdeen Proving Ground.

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Ammunition Test No. 2:

1. Purpose: To determine the comparative functioning of test ammunition.

2. Method:

a. During all tests all malfunctions of weapons and the causes therefor were carefully noted and recorded.

b. All brass was examined for malformation, split cartridge cases and blown primers.

3. Results:

a. Only four instances of malfunctions during firing attributable to the ammunition occurred.

(1) 2 Rounds, Cal. .280 Ball, fired from the EM-2 rifle resulted in ruptured cartridges.

(2) The Cal. .30 T-103 observing rounds had insufficient power for complete recoil of the T-25 rifle.

b. All other malfunctioning of weapons apparantly was due to the weapons themselves. Details of mechanical failures and malfunctioning are in rifle Test No. 34.

c. One misfire occurred in over 200,000 rounds of firing of .280 ammunition. No hangfires or blow backs occurred.

d. Periodic inspections by test officers of rifle bores with a borescope revealed heavy metal fouling in the EM-2 and T-25 and light metal fouling in the FN.

e. (1) Heavy carbon fouling accumulated in the piston of the T-25 requiring the piston to be reamed out after each 200 rounds. On several occasions the gas plug stuck requiring considerable effort for removal. On several occasions the piston also stuck and had to be hammered out of the gas cylinder.

(2) The piston and gas plug of the FN stuck in a similar manner to the T-25 but with less frequency.

4. Analysis: All test rounds are equally satisfactory in respect to the effect on functioning of the weapons with the exception of the caliber .30 T-103 observing round which had insufficient power for complete recoil.

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Ammunition Test No. 3:

1. Purpose: To determine the suitability of tracer and observing ammunition for combat.

2. Method:

a. Functioning of Tracer Rounds.

(1) Tracer rounds were fired to determine whether or not they could be seen against light background, dark background and bright sky. Two observers were located at each of three posts; at the gun position, at 100 yards to the left of the gun position, and at 100 yards to the right of the gun position.

(2) Tracer was checked by observers forward of the gun line in daylight, at dusk and at night to determine whether or not the line of fire could be traced back to the gun. Three guns were concealed by panels so that the flash and smoke would not disclose the gun positions. Observers were established to the right and left front at ranges from 100 to 1000 yards within an angle of 5° from the line of fire.

(3) Characteristics and malfunctions of all tracer were noted.

b. Functioning of Observing Rounds: Observing ammunition was fired into sandy soil, hard clay, grass covered terrain and brush to check functioning. In this phase of the test the German 7.92 mm observing round was used as a control item.

c. Target Designation:

(1) Both the tracer and observing rounds were used to determine whether or not targets could be pointed out at ranges from 50 yards to 1000 yards in bright sunlight, in overcast sky, at dusk, at night, and at night when the foreground was illuminated by 60 mm mortar illuminating ammunition.

(2) Observers were located at the firing point and on line with the weapon at 100 yards to its right and left. Two observers were located at each post.

(3) Observers reported whether or not the tracer or observing round fired was seen and described the target designated.

3. Results:

a. Visibility and Functioning of Tracer Round When Fired into Various Backgrounds:

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(1) Into the Sun:

ROUND	No. RDS. FIRED	LEFT FLANK - RIGHT FLANK	IN REAR OF GUN
M-1	10	None Observed	None Observed
T-102	10	" "	" "
.280	10	" "	" "

(2) Dead Brush at 200 Yards

M-1	10	None	None	5
T-102	10	1	None	5
.280	10	None	3	5

(3) Light Green Trees:

M-1	10	8	10	10
T-102	10	10	8	6
.280	10	9	10	10

(4) Dark Green Trees:

M-1	10	8	9	9
T-102	10	None	10	10
.280	10	10	10	10

(5) Into Sky Away From the Sun:

M-1	10	2	7	7
T-102	10	None	7	3
.280	10	1	6	9

(6) All observers reported that the color of the trace of the .280 round made it easier to see in bright daylight than the other type of tracer.

b. Location of Gun Position by Observation of Tracer Rounds:

(1) By daylight one observer at 400 yards observed only one round and from it he could not locate the gun position.

(2) At dusk and at night, all observers saw all tracer. However, neither in single round firing nor in varying sized bursts of fire, could any of the observers locate the position of the gun.

c. Functioning of Tracer Rounds:

(1) It was impossible to determine whether or not all rounds of the test tracer functioned during daylight, but at night every round fired was seen.

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(2) An average of two rounds out of ten of the M-1 tracer failed to function.

(3) The M-1 appeared to ignite at 25 to 50 yards from the muzzle of the rifle and die out at approximately 950 yards. It was bright orange in color.

(4) The .280 tracer appeared to ignite at 50 to 100 yards from the muzzle of the rifle and burn out beyond 1000 yards. It was bright rose in color.

(5) The Tracer, T-102, appeared to ignite at 75 yards from the muzzle of the rifle and appeared to die out at 1000 yards. By daylight observers in rear of gun and to flanks reported that the ignition point was discernable by a small puff of smoke. It was orange-red in color.

d. Functioning of Observing Rounds (paragraph 2b, above):

(1) Functioning against grass land with sandy sub-soil - Grazing Fire:

Weapon	Ammunition	No. of Rounds	Range	Results
		PRONE		
EM-2	.280	10	200 Yds.	4 rds functioned on ricochet. 6 Failures.
T-25	.30	10	200 Yds.	1 Muzzle Burst. 2 rds functioned on ricochet. 7 Failures
Mauser	7.92 mm	10	200 Yds.	2 Partial. 5 Failures 3 Functioned on ricochet
		STANDING		
EM-2	.280	10	150 yards	2 complete 3 partial 5 failures
T-25	.30	10	150	3 Partial 1 Ricochet functioned in the air. 6 failures.

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(Continued)

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(cont'd) (1) STANDING

Weapon	Ammunition	Number of Rounds	Range	Results
Mauser	7.92mm	10	150 yds.	2 complete 6 partial 1 functioned on ricochet 1 failure

Figure No. 1

(2) Functioning against same target (1) but at long range:

STANDING - 800 Yards

Weapon	Ammunition	Number of Rounds	Results
EM-2	.280	10	8 complete 1 functioned after delay 1 failure
T-25	.30	10	3 complete 7 failures
Mauser	7.92 mm	10	8 complete 2 failures

Figure No. 2

(3) Functioning against various types of target:

BY DAY

			TYPE TARGET		
Weapon	Ammunition	Rounds Fired	Iron sheet on Forward slope 900 yards	Clay Patch on Forward Slope 400 yards	Grass Patch in Brush 900 yards
EM-2	.280	30	6 partial 1 complete 3 failures	1 partial 3 complete 6 failures	2 partial 8 failures
T-25	.30	30	1 partial 1 complete 8 failures	4 partial 4 complete 2 failures	4 complete 6 failures
Mauser	7.92	30	2 partial 3 complete 5 failures	3 partial 7 complete	8 complete (2 with long delay) 2 failures

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(cont'd) (3) BY NIGHT

Weapon	Ammunition	Rounds Fired	TYPE TARGET: Iron Sheet on Forward Slope 900 yards	Clay Patch on Forward Slope 400 yards	Grass Patch in Brush 900 yards
EM-2	.280	30	1 complete 9 failures	3 complete 1 complete w/long delay 6 failures	5 failures (5 rds only)
T-25	.30	30	2 complete 8 failures	(3 RdsOnly) 1 complete 2 failures (Firing pin broke)	5 failures (5 rds only)

Figure 3

e. Target Designation (paragraph 2c, above)- Tracer Ammunition:

(1) When tracer was fired toward the sun, no observer was able to see any tracer.

(2) By daylight at ranges of less than one hundred yards, no observer was able to see any tracer.

(3) By daylight the following rounds were seen and targets designated:

Range To Target	Rounds Fired	Flank Observers on Gun Line. No.of Rds. Seen	Gun Observer No. of Rounds Seen
M-1 TRACER			
100	10	None	2
200	10	3	4
400	10	4	5
T-102 Cal. .30 Tracer			
100	10	2	5
200	10	4	9
400	10	5	10
.280 Tracer			
100	10	1	9
200	10	10	10
400	10	9	10

Figure No. 4

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(4) At longer ranges above 400 yards, observers could see all rounds that functioned.

(a) At dusk, after dark and under flares the test tracer ammunition (T-102 and .280) could be seen and targets designated at 75 yards or more.

(b) The M-1 Tracer could be observed at 100 yards and beyond.

(c) Below 75 yards for the T-102 and the .280, and below 100 yards for the M-1, tracer rounds could not be seen nor the target picked up.

(d) At ranges greater than 100 yards, all tracer could be seen equally well.

f. Target Designation (paragraph 2c, above)- Observing Ammunition:

(1) Observing ammunition gave four results:

(a) Failure to function. No target recognition possible.

(b) Partial functioning, giving off only a small wisp of smoke, Target recognition not reliable.

(c) Ricochet resulting in air burst. Target designation not accurate.

(d) Complete functioning giving excellent observation of strike and target designation.

(2) At ranges of less than 200 yards on flat ground, observing ammunition tended to ricochet making target designation doubtful .

(a) When firing at ranges of less than 200 yards at dusk and at night under illumination, the flash occurring on impact tended to mislead observers as to the true range of the target.

(b) At ranges greater than 250 yards, the smoke from all functioning rounds could be seen to the limit of visibility.

(c) At night all observers could see the flash but none could recognize point of impact, or estimate the range to it.

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(3) The Cal. .30 observing round for the T-25 rifle had insufficient power to recoil the weapon.

4. Analysis:

a. The color and ignition point of the trace of the .280 tracer made it easier to see than the other rounds in daylight.

b. All test tracer was equally easy to see at night.

c. The functioning of the observing rounds was erratic, but the .280 is slightly better than the .30. In addition, the Cal. .30 observing round for the T-25 had insufficient power to recoil the weapon.

d. When the observing round functioned, target designation was better at all ranges than with tracer, except at dusk and at night.

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Ammunition Test No. 4: Omitted

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Ammunition Test No. 5:

1. Purpose: To determine the comparative incendiary effect of API, observing and tracer ammunition.

2. Method:

a. The following types of ammunition were used:

(1) Cal. .280:

(a) API (23A)

(b) Tracer (32A)

(c) Observing

(2) Cal. .30:

(a) API (T-101)

(b) Tracer (T-102)

(c) Observing (T-103)

(d) API (FA40)

(e) Tracer (M25)

b. Rounds of each type were fired into wood, straw, baled cardboard, baled paper, ammunition containers, canvas and rubberized material, loose paper behind wood, cloth behind wood, gasoline in 5-gallon can in the open, gasoline in 5-gallon can in a truck and gasoline in container when part of gas had leaked on the ground.

c. Rounds were fired at gasoline targets until one hit was obtained.

d. Other targets were fired at until five hits were obtained on the target or until ignition occurred.

3. Results:

a. All firing failed to ignite the following materials:

(1) Tightly baled cardboard.

(2) Tightly baled paper.

(3) Ammunition containers and boxes.

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(4) Loosely piled straw.

(5) Baled canvas or rubberized material.

(6) Loose cotton rags in a wooden box.

(7) Loose paper behind a pine board.

b. Straw behind boards was ignited by both Cal. .30 API T-101 and Cal. .30 Tracer T102, but no ignition occurred on refiring.

c. Cal. .280 Tracer ignited gasoline in a can in the open. No other round had any incendiary effect on this target.

d. A five gallon can of gasoline with gasoline spilled on the ground around it was ignited only by Cal. .280 Tracer 32A, Cal. .280 Observing and Cal. .30 Observing.

e. Ignition when firing at full gasoline can in truck cab occurred with the following types of ammunition:

Ammunition	Round on which ignition occurred
.30 API FA-40	3rd
.30 API FA-40	3rd
.30 API T101	5th
.280 API 23A	2nd
.280 API 23A	2nd
.280 API 23A	4th
.280 Tracer 32A	2nd
.280 Tracer 32A	2nd
.280 Tracer 32A	5th

f. For details, see inclosure 1.

4. Analysis:

a. The incendiary effect of all rounds against all targets other than gasoline in containers was negligible.

b. The incendiary effect of the .280 Tracer and API were equal against gasoline cans in the cab of a truck and superior to the Cal..30 API.

c. The .280 Tracer was superior to all other rounds in igniting gasoline cans in the open.

d. The value of the incendiary effect of both the Cal. .280 API and Cal. .30 API are doubtful.

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Ammunition Test No. 11:

1. Purpose: To compare the results of test with established military characteristics of small arms ammunition.

2. Method:

Military Characteristics of Small Arms Ammunition as established by Army Field Forces Board No. 3 Project No. 2256 and Appendix M to British War Office Policy Statement No. 9 was made and tabulated.

3. Results:

The results of test obtained in the APG test of Ammunition for Lightweight Rifles and at Army Field Forces Board No. 3 were compared to Established Military Characteristics and tabulated. See tabulation in Inclosure No. 1.

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AMMUNITION TEST NO. 11

A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS OF SMALL ARMS AMMUNITION

(All Data Based on Ball (Milk Steel Core) Except for Special Types of Ammunition)

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 FEBRUARY 1950 PROJECT 2256 - AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTE	
			Caliber .280	Caliber .30 T
1	2	3	4	5
1. Requirement for types of Small Arms Ammunition that meet the characteristics outlined below:	1. Object is to produce the ideal small arms round for the new automatic rifle and new machine guns 2. Ammunition must be suitable for use with the new snipers rifle. (3" group of 5 rounds at 200 yards - Flat Trajectory to 800 yards)	APG Test	At 600 yards Mann Barrel - MR 9.76 Does not meet this test 27 finds test factory in terms of	At 600 yards Man Barrel - MR 5.4 requirement, howev Rifle and Ammuniti US M1C sniper rif
2. GENERAL: a. Military Characteristics are designed to produce the necessary types of ammunition to meet the requirements of the Infantryman for combat. b. Paramount consideration in order of priority: (1) Stopping Power and Accuracy. (2) Range. (3) Reduction of weight and bulk (see also Col 2 par-6)		Med.Div.Rpt Wound Ballistics of .280 and .30 Cal. Bullets. Test 5 APG Rpt. App. B	B o t h S a t i s f a c t o See 3a below: Compare U. S. standard round .396 g 3.34 inches with 280 round .322 gra 2.54 inches and T-65 Cal.30 .364 gr 2.78 inches.	

AMMUNITION TEST NO. 11

A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS OF SMALL ARMS AMMUNITION

(All Data Based on Ball (Mild Steel Core) Except for Special Types of Ammunition)

U.S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 February 1950 PROJECT 2256 - AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTED	
			CALIBER .280	CALIBER .
1	2	3	4	5
3. PERFORMANCE:				
a. Penetration:	4. Penetration of helmets and body armor to 600 yards and cause incapacitating wound required, desirable to 1000 yards.	APG Report Test No. 1	100% helmet penetration at 1200 yards. 70% body armor penetration at 1000 yards. 20% at 1200 yards.	100% helmet at 1200 yard armor penetr 1000 yards. yards.
(1) Penetrate Equipment helmets and body armor to 1200 yards and cause fatal wound.				
(2) Penetrate unarmored vehicle and produce fatal wound on personnel therein to 1200 yards.	5. Effective as possible against personnel in soft skinned vehicle and protected by loose earth and light cover. This performance should equal .303 M47 but is subsidiary to 3 and 4.		Penetrates one 10 gauge mild steel plate at 800 yards and one at 600 yards.	Penetrates o gauge mild s at 800 yards at 600 yards
(3) Kill enemy protected only by uniform to 2000 yards.	3. Incapacitate enemy personnel protected only by clothing and equipment to 2000 yards.		Energy at this range sufficient to ca wound.	
b. Accuracy: At 600 yards all shots shall strike within a circle 16" in diameter. (bench rest).		APG Report	Mann Barrel, Circle 25" in diameter.	Mann Barrel, 19.4" in dia
	8. a. Be capable of obtaining a 3" group with 5 rounds at 200 yards when fired from a snipers rifle.	APG Test 3	Mann Barrel Circle diameter 9" (Interpolated)	Mann Barrel diameter 6.3 (Interpolate
	b. Be capable of a 6" group at 200 yards with 5 rounds when fired from the Light Automatic Rifle.	Board 3 Rifle Test 6.	Circle diameter 15".	Circle diame
	c. Machine gun performance 90% beaten zone not greater than 130 yds long by 17 yards wide at 2000 yards. (as flat as possible)	- - - - -	Not Computed.	

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AMMO. TEST 11 - A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS SMALL ARMS AMMUNITION
(All Data Based on Ball (Mild Steel Core) Except for Special Types of Ammunition)

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMY AMMUNITION 17 February 1950 PROJECT 2256 - AFF Board #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTED	
			Caliber .280	Caliber .30 T6
1	2	3	4	5
c. Trajectory: At 700 yards the maximum ordinate shall not exceed five feet.	9. Trajectory: As flat as possible. It should not be worse than 303 M47 to 600 yards.	APG Test No. 5	Maximum Ordinate 700 yards - 8.6'. Max. Ord. 600 yds 4.6'.	Maximum Ordinat yards - 5.6'. Max. Ord. 600 y
d. & e. The total elimination of smoke, flash and corrosive effect desired in that order of importance. Some worsening of corrosive effect will be tolerated to eliminate smoke and flash. Some worsening in flash will be tolerated to lessen smoke.	12. The ideal aimed at is no smoke and flash. Of the two, smokelessness is the more important.	Board #3 Test 18 and APG Test #11.	Neither round is smokeless or flashless two rounds the Caliber .30 T65 produces most smoke and flash.	
4. TYPES OF AMMUNITION: All having matching trajectories.		APG Test 12 App U & Test #12	Trajectories not the same in either ca Ball cartridge mild steel core.	
a. General Purpose Round: Penetrate 1/4 inch homogenous armor plate at 100 yards. Greater penetration desirable but not at the expense of weight and bulk.		AFF Bd.#3 Ammo.Test 3 & 5	Penetrates .039" of armor plate at 100 yards.	Penetrates .23 armor plate at yards.
b. Tracer: A dim trace to sixty yards thereafter, a bright trace to at least 1000 yards.	a. Tracer have dark ignition followed by a brilliant trace to 800 yards trajectory to match as nearly as possible the standard round to 800.		Average length dark trace - 64 yards. Average length of bright trace - 1061 yards.	Average length trace - 50 yar Average length bright trace - yards.

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AMMUNITION TEST NO. 11 - A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS SMALL ARMS AMMUNITION
(All Data on Ball (Mild Steel Core) Except for Special Types of Ammunition)

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 February 1950 PROJECT 2256 - AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTED	
			Caliber .280	Caliber .30 T65
1	2	3	4	5
c. Incendiary Round: Same penetration as general purpose round. Be capable of igniting fuel tank, lightly armored vehicles short range, unarmored vehicles medium range. Ignite combustible material normal to combat.			Penetrates .393 of armor plate at 100 yards. 29% of rounds fired ignited gasoline behind mild steel plates.	Penetrates .550 of armor plate at 100 yards. 17% of rounds fired ignited gasoline behind mild steel plates.
d. Day and Night Spotting Round: Produce on impact plainly visible smoke by day and flash by night. Function on impact on all types of surfaced and at all angles of impact. If one round cannot be produced, a night spotting and a day smoke round will be acceptable.	b. An observing round for indicating bullet strike, match ballistically the standard round at all ranges to 2000 yards. It should give effective observation up to 2000 yards.	APG Test 12	Average of 5 out of 8 rounds fired functioned.	Average of 1 round out of 7 fired functioned.
		AFF Bd.3 Ammo. Test #3	Army Field Forces Board No. 3 results gave erractic functioning, caliber .30 has insufficient power to function rifle. Smoke of all functioning rounds satisfactory. Flash at night of no value for target designation.	
e. Blank and Dummy rounds required as training aids.			Dummy round furnished. No Blanks.	No Dummy or Blanks furnished.

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AMMUNITION TEST NO. 11 -- A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS SMALL ARMS AMMUNITION
(All Data Based on Ball (Mild Steel Core) Except for Special Types of Ammunition

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 FEBRUARY 1950 PROJECT 2256 - AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTE	
			Caliber .280	Caliber .30
1	2	3	4	5
f. If required, a round for launching rifle grenades will be provided.		APG Test No. 4 AFF Bd.3 T - 15	Special cartridge required furnished an meets requirements.	
	10. The Ammunition shall be rimless.		All rounds are Rimless.	
5. PHYSICAL CHARACTERISTICS:				
a. Caliber: Shall be as small as possible without compromizing performances. Not greater than .30 caliber.		AFF Bd.3 Appendix B	Caliber .280	Caliber .30
b. Weight: The complete round shall be as light as possible commensurate with other requirements.		AFF Bd.3 Appendix B	Weight single round ---.0455 Length ------2.53"	Weight single round -- .0 Length ------2.
	6. Caliber, charge weight, bullet, weight: It should be such that no objectionable recoil will be produced on the shoulder of the firer when the (continued)	AFF Bd.3 Appendix B	Caliber - .280 Bullet Wt.-139.6 Grs. Charge - - 30.57 Grs. Muzzle Velocity - 2273 F/S	Caliber - .30 Bullet Wt.-136. Charge - - 46.5 Muzzle Velocity 2273

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AMMUNITION TEST NO. 11 -- A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS SMALL ARMS AMMUNITION
(All Data Based on Ball (Milk Steel Core) Except for Special Types of Ammunition

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 FEBRUARY 1950 PROJECT 2256 - AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revise) 31 OCTOBER 1949	TEST OR REFERENCE NO.	AMMUNITION TESTED	
			Caliber .280	Caliber .30 T65
1	2	3	4	5
	(continued)			
	ammunition is used in the rifle and the firer clad in tropical clothing.		Recoil EM-2 - 6.5 Ft/Lbs Recoil Velocity - 6.98 Ft/Sec. Muzzle Energy-1681 Ft/Lb Recoil FN - 6.63 Ft/Lbs. Recoil Velocity - 6.82 Ft/Sec.	Recoil - - 8.29 F Recoil Velocity - F Muzzle Energy - 2 Ft/Lbs when fired T-25 it gives exc kick.
	7. Blast from the muzzle when fired from the automatic rifle must not be objectionable to other firers in the vicinity who may be 1 1/2 yards from the muzzle.	AFF Bd.3 Rifle Test 33	No objectionable side or back blast from either rifle tested.	Objectionable sid back blast in tes rifle T-25.
6. ARMAMENT: The ammunition shall be usable in all light-weight rifles and lightweight machine guns under development and standard .30 caliber weapons after minimum modifications.			No comment - Statement of policy.	

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AMMUNITION TEST NO. 11 -- A COMPARISON OF TEST RESULTS WITH ESTABLISHED MILITARY CHARACTERISTICS SMALL ARMS AMMUNITION
(All Data Based on Ball (Mild Steel Core) Except for Special Types of Ammunition)

U. S. MILITARY CHARACTERISTICS FOR SMALL ARMS AMMUNITION 17 FEBRUARY 1950 PROJECT 2256 -- AFF BOARD #3 AS AMMENDED	BRITISH WAR OFFICE POLICY STATEMENT NO. 9 - APPENDIX M - USER REQUIREMENT FOR A NEW SMALL ARMS AMMUNITION (Revised) 31 October 1949	TEST OR REFERENCE NO.	AMMUNITION TESTE	
			Caliber .280	Caliber .30
7. CLIMATIC DEPENDABILITY: a. Satisfactory performance from -65° to 125°F ambient temperature. b. Storage to 80° and to plus 165°F without effecting performance.		APG Rpt	No failures to function at either temp NOT CONDUCTED.	
8. TRANSPORTATION REQUIREMENT: a. Ammunition shall be safe during transportation in all types of vehicles over rough terrain. b. Ammunition shall be safe for subsequent use after free air drop in its service container, provided it is serviceable from a standpoint of visual inspection.	13. Parachute Dropping: It is essential that the ammunition if accidentally free dropped in service container, should be safe for subsequent use provided it is visually serviceable.		NOT TESTED.	

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ARMY FIELD FORCES BOARD NO. 3
Fort Benning, Georgia

APPENDIX E - DEFICIENCIES AND SUGGESTED MODIFICATIONS

REPORT OF TEST - PROJECT NO. 2231

APPENDIX E

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APPENDIX E: Deficiencies and Suggested Modifications.

A. RIFLES

1. EM-2 Rifle, Caliber .280:

Deficiency	Result	Suggested Modifications
a. Locking lugs break.	Rifle fails to fire	Eliminate breakages. (Note - Breakages are due to faulty hardening of the receiver. When wear occurs the headspace increases and as the wear is often uneven extra strain is thrown on one of the locking levers.)
b. Firing pin spring sets.	Rifle fails to fire.	Redesign firing pin spring to eliminate possibility of set. (Note - No trouble has occurred since the modified (double) springs were fitted.
c. Rubber butt plate becomes detached too easily.	Lose rubber butt plate.	Fix rubber butt plate more securely to rifle.
d. Butt catch operates too easily.	Butt comes off releasing working parts; operating rod gets bent due to side pressure.	Make catch more positive.
e. Cheek rest gets hot.	Uncomfortable to fire.	Put better insulation on cheek rest and extend insulation further forward by 1 inch.
f. Forearm of stock heats excessively.	Gun becomes too hot to hold in sustained fire.	Prevent transmission of excessive heat to forearm.
g. Trigger overheats after short period of sustained fire.	Numerous blistered trigger fingers among firers.	Insulate trigger mechanism to eliminate overheating.

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Deficiency	Result	Suggested Modifications
h. Operating handle overheats in sustained fire.	Burns firer's hand if immediate action is required to eliminate stoppage.	Insulate operating handle to eliminate overheating.
i. Direction of ejection too much at right angles to rifle.	Ejects rounds onto adjacent firers.	Change direction more to the front.
j. Magazine release operates too easily.	Magazine is accidentally dropped in bayonet thrusts and crawling through brush.	Make magazine release spring stronger.
k. Change lever too easy to operate.	May be accidentally changed to automatic fire.	Make change lever spring stronger.
l. Safety too easy to operate.	Safety can accidentally be moved from fire to safe while firing.	Make action of safety catch more positive
m. There are no positive first and second pressures in the trigger- (slack and firing pressure).	Firer never knows when to squeeze trigger to fire due to numerous stops and	Redesign trigger action to provide two definite pressures.
n. Front grip screw too difficult to remove.	Requires combination tool to remove screw to get at piston and gas cylinder for cleaning.	Provide means of getting at gas system for cleaning that does not require special tool.
o. Initial unlocking too hard when operating handle is pulled to the rear.	Burns hand when hot; requires two pulls to unlock.	Make opening bolt one smooth operation when operating handle is pulled to the rear.
p. Front grip improperly located.	Most men's left hand naturally grips rifle forward of front grip.	Move front grip forward one inch.
q. Small particles of unburned powder strike the firer in face and	As action moves to rear small particles of unburned powder strike firer on cheek or in eye causing discomfort to firer.	Place deflector on receiver to protect firer.

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Deficiency	Result	Suggested Modifications
r. Firing pin can be inserted in bolt upside down.	Bolt and operating rod cannot be assembled in gun.	Modify firing pin so that it can only be assembled in proper manner.
s. No cleaning kit provided.	Must be cared for with improvised material.	Provision of cleaning kit to be carried in packet together with any essential spare parts.
t. Magazine too heavy.	Requires soldier to carry too much weight.	Lighten magazine to maximum weight of .5 of a lb
u. Pliable sling; poor means of adjustment	Cuts into firer and adjustment slips during firing.	Thicken sling; improve sling adjustment.
v. Sight cannot be easily zeroed by firer.	Action by unit armorer required to zero rifle.	Modify sight mount so that firer can zero his sight by easy positive means.
w. Dispersion too great in automatic fire.	Ineffective fire at automatic rate.	Further development required.
2. FN Rifle, Caliber .280.		
a. Extractor breaks.	Rifle fails to extract round in chamber.	Strengthen extractor and extractor spring.
b. Hammer breaks.	Rifle fails to fire.	Strength hammer to eliminate breakages.
c. Stock too short.	Firers have difficulty getting eye in rear of sight into proper position for sighting.	Lengthen stock.
d. Sight too low.	Same as c. above -and sight becomes too rapidly obscured in sustained fire.	Raise line of sight.
e. Return spring tube weak where connected to receiver.	Tube breaks causing butt to come off. Rifle not rugged enough for bayonet fighting.	Strengthen fitting of tube to receiver.
f. Rear sight develops lateral play -sight slips too readily - no locking point for battle sight.	Sight slips out of set range too easily.	Modify sight mount so that firer can zero his sight by easy positive means.

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Deficiency	Result	Suggested Modifications
g. Operation of change lever either too easy or too hard.	Change lever either moves too easily or requires unusual force for operation.	Redesign change lever and method of holding in place to make operation uniform.
h. Bolt holding open device works loose and fails to operate.	Bolt fails to remain open - screw requires constant check to maintain adjustment.	Redesign holding open device to improve operatio (Note - This was corrected by fitting a washer under the screw of the holding open device).
i. Magazine release too hard to locate by touch	Time lost in changing magazine.	Enlarge magazine release or change to lever release.
j. Ejection is too much to the right	Strikes adjacent firer to the right.	Redesign deflector plate on body cover to change deflection more to front.
k. Forearm is too small in diameter.	When forearm is gripped firmly fingers come over barrel into line of sight.	Enlarge forearm or redesign forearm to include beaver tail.
l. Sling swivels too weak.	Bend after long use.	Strengthen sling swivels.
m. Not sufficiently proof against exposure to sand, water, dust, etc.	Lacks reliability after exposure to sand, water and dust.	Improve functioning under adverse conditions.
n. No cleaning kit provided.	Must be cared for with improvised material.	Provision of cleaning kit to be carried in packet together with any essential spare parts.
o. Forearm of stock heats excessively.	Gun becomes too hot to hold in sustained fire.	Prevent transmission of excessive heat to forearm.
p. Excessive flash.	Discloses position of firer.	Eliminate or materially decrease flash.(longer barrel preferred to flash hider).

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Deficiency	Result	Suggested Modifications
q. Pliable sling; poor means of adjustment.	Cuts into firer and adjustment slips during firing.	Thicken sling; improve sling adjustment.
r. Dispersion too great in automatic fire.	In effective fire at automatic rate.	Further development required.

3. T-25 Rifle, Caliber .30.

a. Front firing pin breaks frequently.	Rifle fails to fire. Dangerous condition could be set up if firing pin stuck in firing pin port in face of bolt.	Change firing pin to eliminate breakages.
b. Gas plug sticks.	Very difficult to remove plug to clean piston and gas cylinder.	Redesign gas plug to eliminate threads.
c. Trigger housing lugs break off.	Trigger group will not properly seat.	Change trigger lug to eliminate breakages.
d. Hammer pin slips from seat.	Rifle fails to operate.	Place backing for hammer pin on all stocks and increase thickness of hammer pin head to prevent unseating.
e. Rear firing pin breaks.	Bolt sticks. Rifle fails to fire.	Modify rear firing pin to eliminate breakages.
f. Stocks break at receiver fitting and under hand guard.	Stock must be replaced. Rifle not rugged enough for bayonet fighting.	Strengthen or redesign stock to eliminate breakages.
g. Hand guard splits.	Hand guard must be replaced.	Strengthen hand guard.
h. Stock in rear of pistol-grip on left side has sharp edge.	Causes blisters and skinned placed on right thumb.	Round off stock to remove sharp edge.
i. Edges of butt plate too sharp - at right angles to stock.	Causes sore shoulders in prolonged firing.	Round butt plate to shape of M-1 rifle.

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Deficiency	Result	Suggested Modifications
j. Gun too complicated.	Difficulties in assembling disassembling, care and cleaning, training, field maintenance.	Redesign rifle in order to produce a simple weapon.
k. Ejection not uniform. Occasional round ejects slightly to the rear hitting firer's right hand, going up sleeve or getting under right elbow.	Burns to blister point.	Correct deflector to secure uniform ejection to the right front.
l. Trigger pull is too hard on open bolt in automatic fire (about 20 pounds),	Makes accurate firing difficult.	Lighten trigger pull on open bolt to the same as for closed bolt firing.
m. Magazine release is poorly located and hard to operate.	Makes removal of empty magazine difficult.	Relocate magazing release so that it can be easily found and operated.
n. Poorly functioning magazine.	Contributory cause of stoppages.	Redesign magazine.
o. Safety is too hard to find and operate.	1. Difficult to tell by feel (in dark) whether or not rifle is on safe. 2. Difficult to operate with gloved hand.	Redesign safety to obtain shape of M-1 rifle safety.
p. Necessity for provision of combination tool.	Rifle cannot be field stripped without tool.	Change method of stripping so that rifle can be field stripped without a special tool.
q. Forward end of the woodwork of both stock and hand guard are too thin.	Break easily and chars in sustained fire.	Correct design of forearm and hand guard to make stronger and to withstand more heat.
r. Edges of bayonet stud too sharp and shape with ramp on rear does not provide adequate locking for bayonet and bipod.	Cuts hand if it slips in removing gas plug. Does not provide adequate locking device for bipod and bayonet.	Change stud to shape of that on M-1 rifle.

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Deficiency	Result	Suggested Modifications
s. Weak bayonet.	Bayonet handle broke.	Strengthen bayonet.
t. Piston can be placed in cylinder with gas port away from barrel port.	Single shot hand operated rifle.	Make piston so that it can be placed in rifle one way only.
u. No cleaning kit provided.	Rifle must be cared for with improvised material.	Provision of cleaning kit to be carried in packet together with any essential spare parts.
v. Sights unsatisfactory.	Time lost in raising and lowering sights. Both foresight and rearsight become caught in brush and undergrowth.	Redesign sights.
w. Stabilizer improperly designed.	Center of impact moves laterally.	Redesign stabilizer (vertical change not acceptable).
x. Operating handle gets to hot to handle in sustained fire.	Burns firer's hand if immediate action is required to eliminate stoppage.	Insulate operating handle to eliminate overheating.
y. Forearm of stock heats excessively.	Forearm becomes too hot to hold.	Prevent transmission of excessive heat to forearm.
z. Cartridge case ejects over and in front of muzzle of rifle in long burst of automatic fire.	Empty cartridges are hit by the bullets.	Change ejection to the right front.
aa. Sharp report.	Deafens firer and ajacent firers.	Redesign stabilizer.
bb. Excessive flash.	Discloses position of firer	Eliminate or materially decrease flash.
cc. Excessive smoke.	Discloses position of firer.	Eliminate or materially decrease smoke.
dd. Kick excessive.	Bruises firer's shoulder and increases tendency to flinch.	Reduce kick materially.
ee. No cleaning kit provided.	Must be cared for with improvised material.	Provision of cleaning kit to be carried in packet together with any essential spare parts.

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Deficiency	Result	Suggested Modifications
ff. Dispersion too great in automatic fire.	Ineffective fire at automatic rate.	Further development. required.
gg. Cyclic rate too high.	Causes excessive dispersion in automatic fire.	Reduce cyclic rate.
hh. Left hand contacts operating rod.	Annoys firer.	Guard firers hand against contact with operating rod.
ii. Not sufficiently proof against exposure to sand, water, dust, etc.	Lacks reliability after exposure to sand, water and dust.	Improve functioning under adverse conditions.
jj. Magazine too heavy.	Requires soldier to carry too much weight.	Lighten magazine to maximum weight of .5 of a pound.
kk. Change in center of impact with bayonet and grenade launcher excessive.	Ineffective fire with attachments.	Further development required.

B. AMMUNITION

1. British Caliber .280

a. Trajectory too high.	Reduces semi-automatic accuracy and battlesight firing.	Improve round to provide a maximum ordinate not in excess of 4 ft. at 600 yds, and to produce a mean radius with Mann barrel not in excess of 7 inches at 600 yards.
b. Produces flash and smoke.	Discloses gun position.	Reduce flash and smoke to a minimum. Of the two, smokelessness is more important.
c. Incendiary effect of API not good.	Fails to ignite gas, etc. except under ideal conditions.	Improve incendiary effect of API
d. Functioning of observing Ammunition erratic.	Fails to function consistantly on various types of soil at Fort Benning.	Improve functioning of round.

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Deficiency	Result	Suggested Modifications
e. Heavy carbon accumulated in piston.	Reamer required to clean.	Further development required.
2. U. S. Round, Caliber .30		
a. Produces excessive flash and smoke.	Discloses firer's position.	Reduce flash and smoke to a minimum. Of the two smokeless is more important.
b. Incendiary effect of API unsatisfactory.	Fails to ignite gas, etc. except under ideal conditions.	Improve incendiary effect of API.
c. Functioning of observing ammunition erratic.	Fails to function consistantly con various types of soil at Fort Benning.	Improve functioning of round.
d. Tracer round burns out too quickly and is not easily seen in daylight.	Targets cannot be designated beyond 900 yards.	Increase burning time of trace and make trace redder in color.
e. Observing round has insufficient power to recoil rifle.	Semi-automatic rifle becomes a manually operated rifle.	Increase power in round to give satisfactory functioning.
f. Kick too great.	Causes discomfort to firer.	Reduce kick.
g. Heavy carbon accumulated in piston.	Gun will not function, reamer required to clean.	Further development required.

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Test Rifles w/Bayonets Attached

A. British No. 4 Rifle
B. U. S. M-1 Rifle
C. British FN Rifle
D. U. S. T-25 Rifle
E. British EM-2 Rifle

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British No. 4 Rifle w/Combat Load

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U. S. M-1 Rifle w/Combat Load

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British Test Rifle EM-2 w/Combat Load

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British Test Rifle FN w/Combat Load

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U. S. Test Rifle T-25 w/Combat Load

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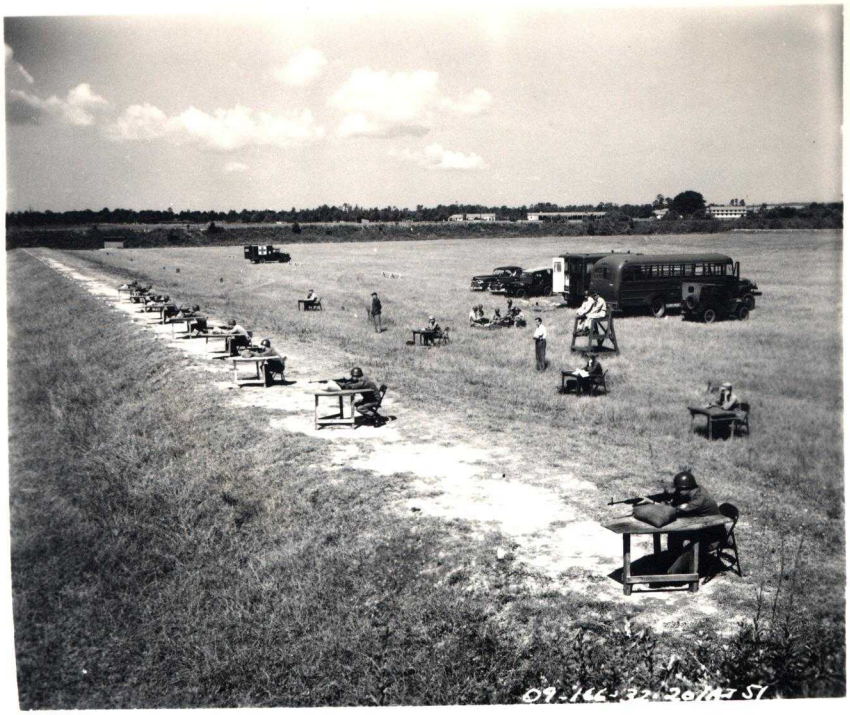

Range Organization Accuracy Firing

Bench Rest

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Accuracy Firing

Bench Rest

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Accuracy Firing

Prone Position

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Accuracy Firing w/Bipod

A. FN
B. EM-2
C. T-25

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ACCURACY FIRING

Standing Position

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Accuracy Firing

Kneeling Position

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Automatic Accuracy Firing

Standing Position

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Combat Range Organization

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Bayonet Course Parry Dummy

FN Rifle

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Bayonet Course Ground Dummy

EM-2 Rifle

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Bayonet Course Thrusting Dummy

FN Rifle

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Left-handed Man with EM-2

(Note Ejection Way)

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HARD USAGE

Sand Slide

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HARD USAGE

Thick Underbrush

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HARD USAGE

Tall Grass

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Arctic Uniform and T-25 Rifle

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APPENDIX K
CONVERTED WEAPONS DEMONSTRATION
13 SEPTEMBER 1950

1. Purpose: In complaince with directive letter (Paragraph 1a, Board Action) a firing demonstration was held by Army Field Forces Board No. 3 at Fort Benning, Georgia to demonstrate the feasibility of conversions which had been made of standard U.S. and U.K. small arms weapons to fire the U. S. test .30 Caliber T-65 ammunition and the U. K. test .280 ammunition.

WEAPONS CONVERTED

British		United States	
Rifle No. 4 Mk.I	.280	Rifle M-1	.280
Rifle No. 4 Mk.I	.30 T-65	Rifle M-1	.30 T-65
LMG Bren	.280	Rifle T-20 E-2	.30 T-65
LMG Bren	.30 T-65	BAR 1918 A2	.280
MMG Vickers	.280	BAR 1918 A2	.30 T-65
MMG Vickers	.30 T-65	LMG 1919 A4	.280
		LMG 1919 A4	.30 T-65

2. Method:

The demonstration was held at English (1000") range on 13 September 1950. Prior to the demonstration the modifications which had been made on the various weapons to accomodate the new rounds were explained.

3. Results:

a. Modifications which had been made:

(1) To .280:

(a) Rifle No. 4 - Mk.1:

1. Bolt Head

2. Extractor

3. Barrel & Chamber

4. Ejector

5. Magazine

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(b) Rifle M-1:

1. Barrel & Chamber
2. Gas Ports enlarged.

(c) LMG Bren:

1. Breech Block
2. Extractor
3. Barrel & Chamber
4. Gas Ports enlarged
5. Magazine.

(d) BAR 1918 A2:

1. Barrel & Chamber
2. Gas Ports enlarged
3. Receiving Block
4. Magazine.
5. Ejector extended.

(e) MMG Vickers:

1. Barrel & Chamber
2. Lock
3. Feed Block
4. Belt
5. Muzzle attachment.

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(f) LMG 1919A4:

1. Barrel & Chamber
2. Belt Holding Pawl
3. Feedway Block
4. Web-belt
5. Belt feed pawl

(2) To accomodate .30 T-65 Round:

(a) Rifle No. 4 Mk. I:

1. Bolt Head
2. Extractor
3. Barrel & Chamber
4. Ejector
5. Magazine

(b) Rifle M-1:

1. Barrel & Chamber
2. Gas Ports enlarged
3. Receiver Block added.

(c) Rifle T-20 E2: (Partially complete modification)

1. Barrel & Chamber
2. Gas Ports enlarged
3. Receiver
4. Magazines

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(d) LMG Bren:

1. Breech Block
2. Extractor
3. Barrel & Chamber
4. Gas Ports enlarged

(e) BAR 1918 A2:

1. Barrel & Chamber
2. Gas Ports enlarged
3. Receiver Block added.
4. Magazine

(f) MMG Vickers:

1. Barrel & Chamber
2. Lock
3. Feed Block
4. Belt

(g) LMG 1919A4:

1. Barrel & Chamber
2. Feedway Block
3. Belt feed pawl.

b. All the modifications are satisfactory except:

(1) The material was too soft in the web belt for the Vickers .280.

(2) The material was too soft in the web belt for the Vickers .30 T-65.

(3) Web belt for the 1919A4 .280 was improperly fitted to round.

(4) Muzzle attachment filler for the Vickers .280 was not properly centered.

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c. Malfunctions:

Weapons	Rounds Fired	No. of Malfunctions
Rifle No. 4 Mk.I .280	26	2
Rifle No. 4 Mk.I .30 T-65	21	None
Rifle M-1 .280	24	None
Rifle M-1 .30 T-65	36	1 Failure to Extract 1 Broken Extractor
LMG Bren .280	45	None
LMG Bren .30 T-65	45	None
BAR 1918A2 .280	60	None
BAR 1918A2 .30 T-65	60	None
MMG Vickers .280	232	1 Failure to Feed Short Round 1 Separated Case
MMG Vickers .30 T-65	117	Excessive malfunctions due to
LMG 1919A4 .280	102	faulty belts.
LMG 1919A4 .30 T-65	108	None

4. Analysis:

All weapons tested could be satisfactorily converted to fire the test rounds.